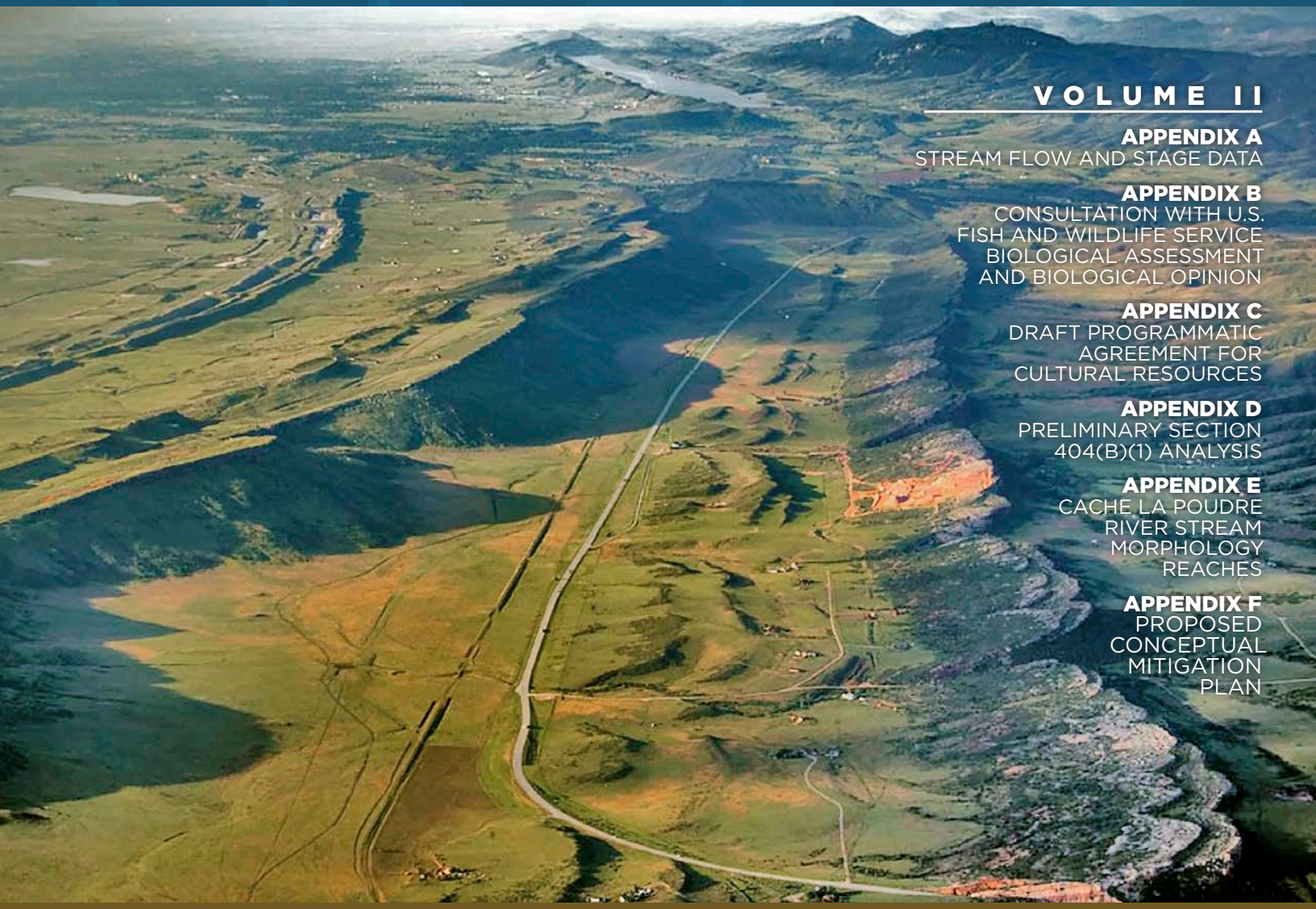
SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

NORTHERN INTEGRATED SUPPLY PROJECT

JUNE 2015



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US Army Corps of Engineers®
OMAHA DISTRICT
1616 CAPITOL AVE., STE. 9000 • OMAHA, NE 68102

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APPENDIX A

STREAM FLOW AND STAGE DATA

APPENDIX A

STREAM FLOW AND STAGE DATA

Appendix A
Stream Flow and Stage Data

The previous Stream Flow and Stage Data in Appendix A of the DEIS has been replaced and is presented in Sections 5, 6, 7, and 8 of the Water Resources Report (CDM Smith 2014a).

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APPENDIX B

CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL ASSESSMENT AND BIOLOGICAL OPINION

APPENDIX B

CONSULTATION WITH U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL ASSESSMENT AND BIOLOGICAL OPINION

Appendix B
Consultation with U.S. Fish and Wildlife Service Biological Assessment and Biological Opinion

Consultation with U.S. Fish and Wildlife Service Biological Assessment and Biological Opinion has not changed and can be found in Appendix B of the DEIS.

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APPENDIX C

DRAFT PROGRAMMATIC AGREEMENT FOR CULTURAL RESOURCES

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Appendix C
Draft Programmatic Agreement for Cultural Resources

The Draft Programmatic Agreement for Cultural Resources has not changed and can be found in Appendix C of the DEIS.

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APPENDIX D

PRELIMINARY SECTION 404(B)(1) ANALYSIS

APPENDIX D

PRELIMINARY SECTION 404(B)(1) ANALYSIS

Appendix D
Preliminary Section 404(b)(1) Analysis

This revised Preliminary Section 404(b)(1) Analysis replaces the Preliminary Section 404(b)(1) Analysis in Appendix D of the DEIS.

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Appendix D
Preliminary Section 404(b)(1) Analysis

U.S. ARMY CORPS OF ENGINEERS
PRELIMINARY SECTION 404(B)(1) ANALYSIS
NORTHERN INTEGRATED SUPPLY PROJECT (NISP)
Department of the Army File Number: NWO-2003-80509

Corps of Engineers Omaha District

Denver Regulatory Office

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List of Acronyms and Abbreviations

AF	acre-foot
Applicant	Northern Colorado Water Conservancy District
BOD	biological oxygen demand
C-BT	Colorado-Big Thompson
CDNR	Colorado Department of Natural Resources
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DA	Department of the Army
DEIS	Draft Environmental Impact Statement
District	Northern Colorado Water Conservancy District
DO	dissolved oxygen
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
Guidelines	Section 404(b)(1) Guidelines
HGM	Hydrogeomorphic
IP	Individual Permit
LEDPA	Least environmentally damaging practicable alternative
µm	micrometers
M&I	Municipal and industrial
NEPA	National Environmental Policy Act
NISP	Northern Integrated Supply Project
NTU	Nephelometric turbidity units
NWR	National Wildlife Refuge
PEM	Palustrine emergent wetland
Project	proposed NISP
PSS	Palustrine scrub-shrub
RFFAs	reasonably foreseeable future actions
ROD	Record of Decision
SDEIS	Supplemental Draft Environmental Impact Statement
TSS	total suspended solids
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

On April 24, 2008, the U.S. Army Corps of Engineers (Corps) received an application from the Northern Colorado Water Conservancy District (District and Applicant) for a Department of the Army (DA) Standard Individual Permit (IP) pursuant to Section 404 of the Clean Water Act (CWA) for the Northern Integrated Supply Project (NISP). The District sought authorization to discharge fill material into approximately 51 acres of potential waters of the U.S. and temporarily impact an additional 19 acres of wetlands and other waters at project sites located in Larimer and Weld Counties, Colorado (Figure D-1). The District will update it application and seek authorization to discharge fill material into approximately 56.8 acres of potential waters of the U.S. and for between 11 acres (Reclamation Action option) and 14 acres (No Reclamation Action option) of temporary effects.

As part of its decision regarding whether to issue a CWA permit for the NISP, the Corps must evaluate the compliance of the proposed Project with the Section 404(b)(1) Guidelines (Guidelines) established by the U.S. Environmental Protection Agency (EPA). This document is a preliminary evaluation of the NISP's compliance with the Guidelines.

This preliminary Guidelines evaluation is based on the information contained in the NISP Draft Environmental Impact Statement (DEIS) and Supplemental Draft EIS (SDEIS) and supporting studies and reports, which are available for review at:
http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado/EISNISP

This preliminary analysis is provided as an appendix to the SDEIS and will be updated for the Final EIS (FEIS). The Corps will not finalize its Guidelines compliance determination regarding the NISP Individual Permit (IP) application until after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS. After publication of the FEIS, the Corps will produce a Record of Decision (ROD) describing the Corps' decision on the DA permit application and its determination of whether the NISP complies with the Guidelines.

1.1 APPLICANT'S PROPOSED PROJECT

The NISP would be a regional water supply project consisting of the 170,000 acre-foot (AF) Glade Reservoir, the 45,624 AF Galeton Reservoir, forebays, pump stations, water pipelines, realignment of 7 miles of U.S. 287, and realignment of four electrical transmission line structures. The Glade dam would be approximately 270 feet tall and would be constructed of earth/rock fill. The Galeton dam would be approximately 75 feet tall and would also be constructed of earth/rock fill. Major construction activities at each reservoir location would include excavation, rock blasting and hauling, and land grading. Construction is planned to commence immediately upon regulatory approval and authorization, and the NISP would be built over a period of approximately 9 years. Construction of the dams, realigned U.S. 287,

pipelines, access roads, and forebays would result in the discharge of fill material into waters of the U.S.

The District's Preferred Alternative is referred to as Alternative 2 in the EIS. Two options for Alternative 2 have been proposed: 1) the Reclamation Action Option, and 2) the No Reclamation Action Option. In the Reclamation Action Option, the District would deliver water to most of the NISP Participants by entering into an excess capacity contract with Reclamation for carriage of NISP water through existing East Slope facilities of the C-BT Project. The contract would cover the use of the following C-BT facilities owned by the United States and operated by Reclamation: Carter Lake, Carter Lake Pressure Tunnel, Flatiron Unit #3 (Carter Pump), Flatiron Reservoir, Hanson Feeder Canal, and Horsetooth Reservoir. It is proposed that NISP would make up these deficits to C-BT by delivering water directly from Glade Reservoir to Horsetooth Reservoir through a new 36-inch diameter pipeline with a capacity of 2,000 AF per month, or about 33 cfs. The Glade-to-Horsetooth Pipeline (Figure D-1) would only be necessary under the Reclamation Action Option in the event that C-BT deliveries to the Poudre River drop below the average volume of water that NISP would deliver to project Participants by storage, carriage, exchange, or in-lieu delivery through C-BT.

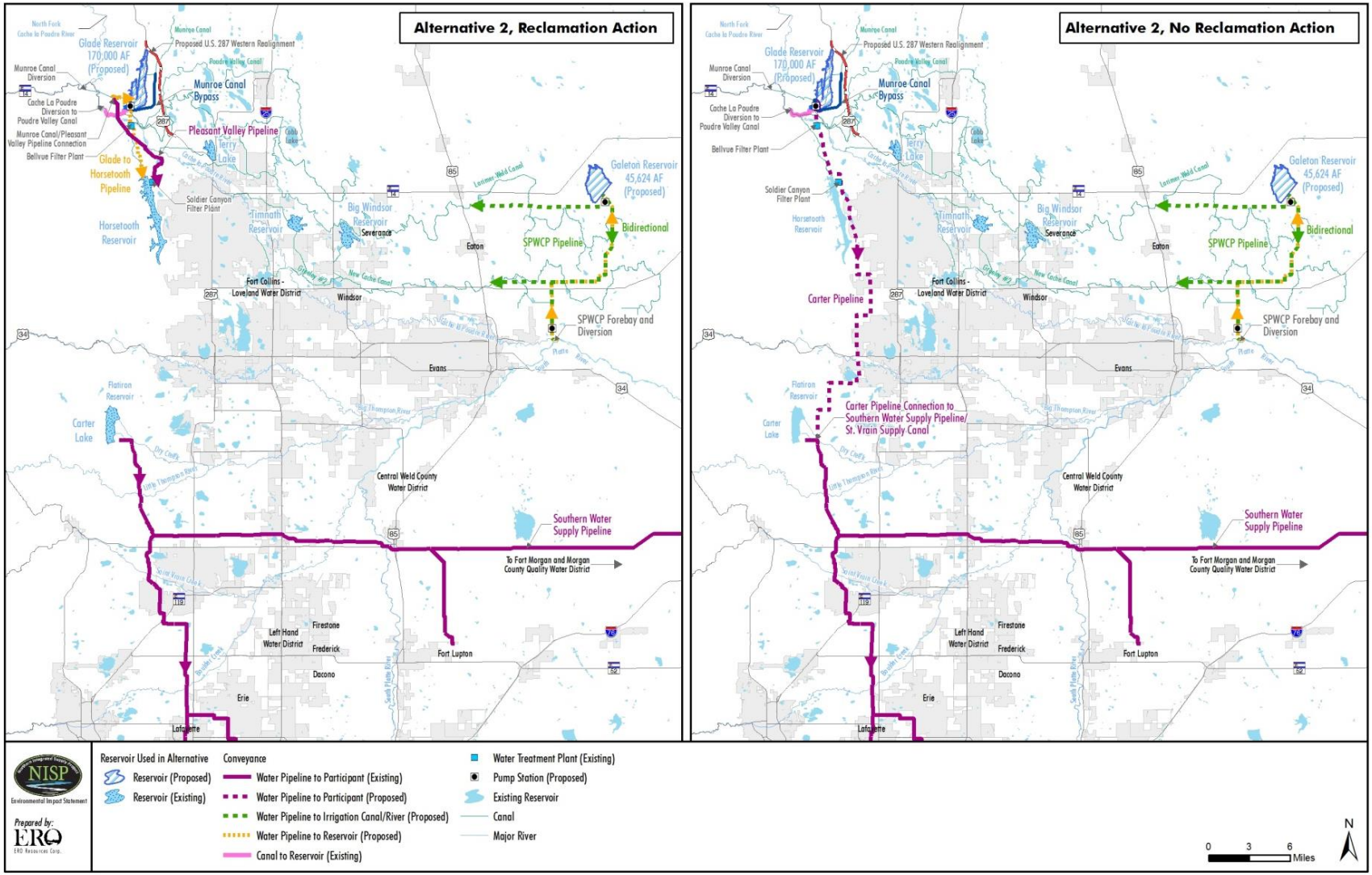
In the No Reclamation Action Option, NISP water would be delivered to all of the Project Participants via the proposed Carter Pipeline. The Carter Pipeline would not require a contract between the District and Reclamation or a connection to Horsetooth Reservoir. The Carter Pipeline would extend 31 miles from the proposed Glade Reservoir south, around the east side of Horsetooth Reservoir, and south to Carter Lake where it would tie into the existing Southern Water Supply Pipeline and the existing St. Vrain Supply Canal (Figure D-1).

The District proposes to include a flow augmentation program with Alternative 2 (both the Reclamation Action Option and the No Reclamation Action Option) to improve Poudre River streamflows, primarily during winter months when flows are low and NISP would generally not be diverting. The District would use water diverted into Glade Reservoir under its Grey Mountain right for flow augmentation. Section 2.5.6 of the SDEIS describes the proposed flow augmentation program.

In addition to the Proposed Action (Alternative 2) the Corps has identified the following alternatives for analysis in the EIS:

- No Action Alternative (Alternative 1) – Cactus Hill Reservoir (120,000 AF) and Agricultural Water Transfer
- Alternative 3 – Cactus Hill Reservoir (190,000 AF), Poudre Valley Canal Diversion, and the SPWCP
- Alternative 4 – Cactus Hill Reservoir (190,000 AF), Multiple Diversion Locations, and the SPWCP

Figure D-1. Applicant's Proposed Project.



1.2 PROJECT BACKGROUND

The proposed Project would use conditional water rights to divert flow from the Poudre and South Platte Rivers for storage in two new reservoirs. The diverted water would be transmitted to 15 Project Participants within the boundaries of the Northern Colorado Water Conservancy District's service area for municipal and industrial uses.

1.2.1 Project Area

The proposed Project is located in northeastern Colorado in Larimer and Weld Counties. The Project includes several study areas described in Section 3.2 of the DEIS and Section 3.1.1 of the SDEIS. The proposed Glade Reservoir site is located approximately 4.25 miles northwest of Laporte, Colorado. The proposed dam site is located in Section 12, T8N, R70W in Larimer County. The proposed Galeton Reservoir site is located about 10 miles east of Ault, Colorado. The proposed dam site is located in Sections 10, 11, and 15 of T7N, R64W of Weld County. Pipelines from the reservoirs would convey water to Participants in Larimer, Weld, Boulder, and Morgan Counties.

The Project area is located within the Cache la Poudre (HUC 10190007) and Middle South Platte-Cherry Creek (HUC 10190003) watersheds. The Poudre River study area covers approximately 55 miles of the river from the canyon mouth (approximate downstream limit of the Poudre Canyon where the river transitions from the confinement of the canyon to an unconfined alluvial channel) to the confluence with the South Platte River (referred to as the "mainstem"). The mainstem was divided into 6 representative segments (A through F) for flow-related resource studies performed for the SDEIS. Each segment had a representative study site. The South Platte River study area includes the area downstream of the Poudre River confluence to the Kersey streamflow gage (USGS 06754000/DWR PLAKERCO). More detailed information on the Poudre and South Platte river basins is found in Section 3.3 of the DEIS and Section 3.2 of the SDEIS.

The climate in the Project area is heavily influenced by the proximity to the Rocky Mountains and the general topography of the area, which varies from hogbacks and valleys at the Glade Reservoir site to flat plains near Kersey, Colorado. The climate is semi-arid with precipitation gradually increasing from west to east. July is the warmest month, with average daily maximum temperatures of 85ºF in Fort Collins to 90ºF in Windsor and average daily minimum temperatures in the mid-50s. The coolest month is January, with average daily maximum temperatures in the low 40s and average daily minimum temperatures ranging from 9ºF at Greeley to 14ºF at Fort Collins (WRCC 2014). The average annual precipitation in the Project area ranges from 12 to 15 inches, and average annual snowfall varies from 29 to 41 inches (WRCC 2014). Strong winds, hailstorms, and summertime thunderstorms occur within the Project area.

The NISP overall study area spans from the foothills of the Rocky Mountains to open grasslands on the eastern plains. This eastern part of Colorado is part of the High Plains section of the Great Plains of the central U.S. Land within the NISP study area is known for its fertile soil and contains some of the most productive agricultural enterprises in Colorado. Until the 1960s, the northern Colorado economy focused on agriculture and other related industries. In 2005, 50.8 % of the total acreage was designated as agriculture, but this percentage continues to drop as rapid population growth results in land use changes (Economic Research Service 2007). Other land uses within the Project area include residential and municipal areas and parks and other recreational areas. Additional information on land use in the Project area is found in Sections 3.21 and 3.27.13 of the DEIS and 3.17 of the SDEIS.

Soils identified in the Project area range from sandy loams to clay loams at the reservoir sites (NRCS 1980, 1982). Rock outcrops occur within the Glade Reservoir study area, including the U.S. 287 realignment study area. Prime Farmlands identified within the Project study area include[1]:

- Glade Reservoir study area: Connerton-Barnum complex, *Santana loam, Santana variant loam, Harlan fine sandy loam, and Heldt clay loam*
- U.S. 287 realignment study area (part of overall Glade Reservoir study area): *Santana loam, Kim loam, Heldt clay loam, Caruso clay loam, and Harlan fine sandy loam*
- Cactus Hill Reservoir study area: Ascalon fine sandy loam and Platner loam
- Galeton Reservoir study area: Olney fine sandy loam and Platner loam
- Agricultural Transfer farmlands supplied by New Cache Ditch: Olney fine sandy loam, and Nunn clay loam, 0 to 6 percent slope, *Nunn clay loam with greater than 6 percent slope, Kim loam, and Otero sandy loam*
- Agricultural Transfer farmlands supplied by Larimer and Weld Ditch: Nunn clay loam with less than 6 percent slope, Stoneham fine sandy loam, and Otero sandy loam, *Santana Variant clay loam, Ascalon sandy loam, Fort Collins loam, Garrett loam, Nunn clay loam with greater than 6 percent slope, Loveland clay loam, Otero sandy loam, Kim loam, Santana loam, and Table Mountain loam*

[1]Soils in *italics* indicate potential Prime Farmlands if irrigated.

Additional information on soils in the Project area is found in Sections 3.9 and 3.27.4 of the DEIS and 3.7 of the SDEIS.

Vegetation cover types occurring within the Project area include grasslands, shrublands, woodlands, agricultural lands, revegetated areas, and disturbed areas, including areas with noxious weeds. Descriptions of vegetation types in the Project area are included in Section 3.10 of the DEIS and Section 3.8 of the SDEIS. Riparian vegetation occurs along ephemeral, intermittent, and perennial streams, including the Poudre and South Platte Rivers, and is described in Sections 3.13 and 3.27.6 of the DEIS and Section 3.9 of the SDEIS.

Wetlands in the Project area were classified according to the Cowardin classification system. Types of Cowardin wetlands that occur in the study areas include palustrine persistent emergent (PEM) wetlands dominated by grasses, sedges, and rushes; and palustrine scrub-shrub wetlands

(PSS) dominated by willows and other shrubs. Wetland functional assessments were conducted based on hydrogeomorphic classes using the FACWet Method – Version 2.0 Review Draft (Johnson et al. 2010). HGM classes found within the study area include: riverine (associated with a stream channel, floodplain, or terrace) and depressional (topographic depression without permanent water >2 meters deep). Descriptions of the types and extent of wetlands and other waters in the Project area are found in Sections 3.12 and 3.27.5 of the DEIS and Section 3.9 of the SDEIS. Construction and operation of the proposed Project alternatives would directly and indirectly affect wetlands and other waters (Table D-1).

Table D-1. Summary of effects on wetlands and waters.

	Alternative 1 (acres)		**Alternative 2 Reclamation Action (acres)**		**Alternative 2 No Reclamation Action (acres)**		**Alternative 3 (acres)**		**Alternative 4 (acres)**	
	Perm.	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**
Direct Effects										
Wetlands	31.8	16.2	44.4	3.9	44.4	10.2	33.7	18.6	33.7	18.7
Waters[1]	6.5	17.3	12.4	2.9	12.4	3.9	92.2	12.3	92.2	12.4
Indirect Effects										
Wetlands	218.6	0.0	9.0[2]	0.0	9.0[2]	0.0	56.0[2]	0.0	47.0[2]	0.0
Waters[1]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**257.1**	**33.5**	**65.8**	**6.8**	**65.8**	**14.1**	**181.9**	**30.9**	**172.9**	**31.1**
Effect Determination	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor

[1]Includes: ponds, lakes, creeks, streams, ditches, and canals (does not include riparian resources).

[2]A shift to species that tolerate greater fluctuations in river stage declines is predicted for wetlands dominated by obligate wetland species within 100 feet of the Poudre River due to predicted reductions in ground water levels. There are an estimated 9 acres of wetlands potentially sensitive to such ground water declines in Segment B under Alternatives 2 and 3.

Table D-2. Summary of flow-related indirect effects on mainstem of the Poudre River wetland and riparian resources.

Predicted Changes to Hydrology and Effects on Resource	Alternative 2 (No Reclamation Action and Reclamation Action)	Alternative 3	Alternative 4
River Stage River stage is affected by flow and channel morphology. Changes in river flows would alter river stage. The assessment of effects associated with changes in river stage focused on near-bank herbaceous wetlands.	Would frequently decrease river stage by 0.5 to 1.0 foot during the growing season. Negligible effect for all segments except Segment B; supportive hydrology would still likely occur. Moderate effects for Segment B; decline in river stage is predicted to result in a shift in species at wetlands dominated by obligate wetland species to those that tolerate greater fluctuations in river stage such as reed canarygrass.	Similar to the effects described for Alternative 2; the timing and magnitude of stage reductions are similar to Alternative 2.	Would frequently decrease river stage by 0.5 to 1.0 foot during the growing season. River Segments A and B are predicted to have fewer declines in river stage compared with Alternatives 2 and 3. Negligible effects as supportive hydrology would still likely occur in all segments.
Alluvial Ground Water Levels Alluvial ground water levels closely match river stage in locations close to the river. The relationship between river stage and ground water levels decreases with distance from the river. Declines in ground water levels focused on predicted declines below the observed maximum ground water depths during the growing season for cottonwood woodlands.	Negligible effects on Segments A, B, and F. Minor effects on cottonwood woodlands in Segments C, D, and E associated with infrequent short-lived declines below the observed maximum ground water depths during the growing season.	Similar to the effects described for Alternative 2; the timing and magnitude of stage reductions are similar to Alternative 2 and declines in alluvial ground water levels are based on reductions in stage. Declines in ground water levels are predicted to be slightly more frequent than under Alternative 2 due to increased diversions required for Cactus Hill Reservoir. Negligible effects on Segments A, B, and F. Minor effects on cottonwood woodlands in Segments C, D, and E associated with infrequent short-lived declines below the observed maximum ground water depths during the growing season.	Similar to Alternatives 2 and 3, except fewer declines in ground water levels are predicted in Segments A and B due to shifting some diversions to downstream of Fort Collins. Negligible effects on cottonwood woodlands in all segments.

Predicted Changes to Hydrology and Effects on Resource	Alternative 2 (No Reclamation Action and Reclamation Action)	Alternative 3	Alternative 4
Inundation Frequent moderate flooding would no longer occur along the mainstem. All alternatives are predicted to further reduce inundation. The assessment of reduced flooding focused on the maintenance of cottonwood woodlands.	Cottonwood woodlands inundated in at least half of the years of the period of record would still be inundated at a similar frequency. Mainstem plant communities associated with frequent flooding are predicted to continue to be inundated.	Declines in inundation are predicted to be slightly more frequent than Alternative 2 due to increased diversions required for Cactus Hill Reservoir. Reduced inundation is predicted to have a moderate effect on some cottonwood stands in Segment E that are predicted to be inundated in at least half of the years during the period of record because the frequency of inundation would be reduced to less than half of the years.	Similar to Alternatives 2 and 3 except fewer declines in inundation frequency are predicted in Segments A and B due to shifting some diversions to downstream of Fort Collins.
Vegetation Communities The plains cottonwood woodlands appear to be on a trajectory that would eventually lead to their decline. Nonnative woody vegetation (e.g., green ash, Russian olive, and Siberian elm) are predicted to increase. In the future, plains cottonwoods would likely not dominate the riparian woodlands along the mainstem. Reed canarygrass is predicted to continue to colonize areas of the formerly active channel downstream of I-25. All alternatives are predicted to further reduce inundation.	Changes in flows associated with Alternative 2 are predicted to reinforce the trajectory. Minor effect; trajectory would continue with or without alternative but may be accelerated.	Minor effect; trajectory would continue with or without alternative but may be accelerated.	Minor effect; trajectory would continue with or without alternative but may be accelerated.

Predicted Changes to Hydrology and Effects on Resource	Alternative 2 (No Reclamation Action and Reclamation Action)	Alternative 3	Alternative 4
Nonnative Species Reed canarygrass has colonized areas of the formerly active channel downstream of I-25 as the channel in this portion of the river continues to aggrade and narrow with accumulated sediment. The current trajectory of less inundation, combined with potential changes in tree canopy cover and potentially greater recreational use of the mainstem riparian plant communities, would likely lead to the increased presence and distribution of nonnative vegetation.	Changes in flows associated with Alternative 2 are predicted to accelerate and/or reinforce the well-established trajectory. Minor effect; trajectory would continue with or without alternative.	Minor effect; trajectory would continue with or without alternative.	Minor effect; trajectory would continue with or without alternative.
Recruitment of Woody Riparian Vegetation Green ash, narrowleaf cottonwood, plains cottonwood, box elder, and possibly Russian olive are currently an important component of the regenerating riparian forest. The current woodland overstory, typically dominated by plains cottonwood, would likely become characterized by a greater mix of these tree species in the future.	Changes in flows associated with Alternative 2 are predicted to accelerate and/or reinforce the well-established trajectory. Minor effect; trajectory would continue with or without alternative.	Minor effect; trajectory would continue with or without alternative.	Minor effect; trajectory would continue with or without alternative.
Wetland Functions – Depressional Wetlands	Little predicted change in function; negligible effect. All Poudre River study site depressional wetlands are functioning under all alternatives with Segment F ranking the highest and Segment B ranking the lowest. Negligible effects would occur to the functions and services of depressional wetlands.	Little predicted change in function; negligible effect. All Poudre River study site depressional wetlands are functioning under all alternatives with Segment F ranking the highest and Segment B ranking the lowest. Negligible effects would occur to the functions and services of depressional wetlands.	Little predicted change in function; negligible effect. All Poudre River study site depressional wetlands are functioning under all alternatives with Segment F ranking the highest and Segment B ranking the lowest. Negligible effects would occur to the functions and services of depressional wetlands.

Predicted Changes to Hydrology and Effects on Resource	Alternative 2 (No Reclamation Action and Reclamation Action)	Alternative 3	Alternative 4
Wetland Functions – Riverine Wetlands	Negligible to minor effect. Wetland functions for riverine wetlands would decline to functioning impaired except for Segment F, which would remain as functioning. Functional rankings for existing conditions were on the lower end of the functioning category; therefore, small changes in the scoring would result in a change to functioning impaired.	Negligible to minor effect; similar to Alternative 2.	Negligible to minor effect; wetland functions for riverine wetlands would remain as functioning except for Segment C, which previously was functioning impaired and Segment E, which would decline to functioning impaired.
Other Flood-Related Functions Inundation is also associated with a variety of ecological processes including flushing salts, creating bare substrate for the establishment of riparian vegetation, recharging soil moisture, and exporting nutrients.	Moderate effect; inundation would occur less often under Alternative 2 and this would reinforce the well-established trajectory for the mainstem riparian corridor and floodplain, which includes a reduction of functions associated with inundation.	Moderate effect; similar to Alternative 2 because of reduced inundation.	Moderate effect; similar to Alternative 2 because of reduced inundation.

1.3 THE CORPS' AUTHORITY AND SCOPE OF ANALYSIS

1.3.1 Section 404 of the Clean Water Act

Activities affecting waters of the United States may be subject to the jurisdiction of the Corps under Section 404 of the CWA. The Corps authorizes the discharge of dredged or fill material into waters of the U.S. via a Section 404 permit. As part of its decision regarding whether to issue a CWA permit for the NISP, the Corps must evaluate the compliance of the proposed Project with the Guidelines. Under Subpart B of the Guidelines, the Corps' evaluation of the proposed NISP must include the following determinations:

- **40 CFR 230.10 (a)**: Whether there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. This alternative is referred to as the *least environmentally damaging practicable alternative* or the LEDPA. This preliminary alternatives analysis is presented in Chapter 2, "Finding of Practicable Alternatives."

- **40 CFR 230.10 (b)**: Whether the discharge would violate any applicable state water quality standards, Section 307 of the CWA, the Endangered Species Act (ESA), or federal laws concerning marine sanctuaries. The preliminary evaluation of the proposed NISP with respect to this determination is presented in Chapter 3, "Restrictions on Discharge."
- **40 CFR 230.10 (c)**: Whether the discharge would cause or contribute to significant degradation of waters of the U.S. The preliminary evaluation of the proposed NISP with respect to this determination is presented in Chapter 4, "Finding of No Significant Degradation."
- **40 CFR 230.10 (d)**: Whether appropriate and practicable steps have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem. The preliminary evaluation of the proposed NISP with respect to this determination is presented in Chapter 5, "Minimization of Potential Adverse Impacts."

Evaluation of a proposed project under the conditions listed above constitutes a determination of compliance with the Guidelines. During the permit process, the Corps considers the views of other Federal, Tribal, state, and local agencies, and the general public. However, the Corps is solely responsible for reaching a decision regarding the permit application, including an independent determination of the project purpose, the extent of the alternatives analysis, which alternatives are practicable, the LEDPA, the amount and type of mitigation that is to be required, and all other aspects of the decision-making process.

1.3.2 National Environmental Policy Act

Based on a review of the NISP, the Corps determined that the NISP would likely significantly affect the quality of the human environment and, therefore, an Environmental Impact Statement (EIS) was prepared. The Corps is the lead Federal agency for compliance with the National Environmental Policy Act of 1969, as amended (NEPA) and will use the EIS, in part, in rendering a final permit decision. The Corps is being assisted in the NEPA process by several cooperating agencies, which provide input on resources and analyses for which they have jurisdiction by law or special expertise with respect to environmental impacts. The NISP EIS cooperating agencies include Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), Larimer County, and Colorado Department of Transportation (CDOT). After release of the DEIS, the Colorado Department of Natural Resources (CDNR) became a cooperating agency and the Colorado Department of Public Health and Environment (CDPHE) became a limited scope cooperating agency.

According to the Guidelines, the NEPA alternative and impact analysis should provide sufficient information to evaluate compliance with the Guidelines. As stated in the Guidelines: *For actions subject to NEPA, where the Corps of Engineers is the permitting agency, the analysis of alternatives required for NEPA environmental documents, including supplemental Corps NEPA documents, will in most cases provide the information for the evaluation of alternatives under*

these Guidelines. Similarly, the Corps' Standard Operating Procedures for the Corps' Regulatory Program state that "Districts should not conduct or document separate alternatives analyses for NEPA and the 404(b)(1) Guidelines." The EIS has been prepared in compliance with the Corps' NEPA implementation procedures for its regulatory program (Appendix B of 33 CFR Part 325), the Section 404(b)(1) Guidelines (40 CFR 230), and applicable public interest review factors identified at 33 CFR Part 320.4. A final Section 404(b)(1) analysis will be completed as part of the evaluation of the Section 404 permit application, after a FEIS is issued. This appendix is a preliminary evaluation of the issues involved in a 404(b)(1) analysis and is not intended to be the final evaluation.

NEPA Scope of Analysis Factors:

(1) Whether or not the regulated activity comprises "merely a link" in a corridor type project. Regulated activities that comprise merely a link in corridor-type projects (e.g., roads or utility lines) typically result in a narrow scope of analysis limited to the specific activity requiring a DA permit unless such a significant portion of the project is located in waters of the U.S. that the Corps' permit bears upon the origin and destination of the project as well as its route [33 CFR 325, Appendix B, 7(b)(3)]. This factor is most obviously relevant to a long-distance pipeline project, electric transmission line project, or highway that crosses waters of the U.S., but is also applicable to the roads and utility lines that serve the applicant's project and cross waters of the U.S. on the project site.

As shown in Table D-3, depending on the alternative the project's roads and utility crossings together constitute between 760 to 1192 acres of disturbance of which approximately 11 to 22 acres would occur in waters of the U.S. In the Corps' judgment, based on a review of the proposed conceptual site plan, the impacts associated with these crossings do not represent a major portion of the roads or utility lines, nor do they govern the origin, destination, or overall route of those features. Therefore, other factors must be analyzed to assess the extent of federal control and responsibility.

(2) Whether there are aspects of the upland facility in the immediate vicinity of the regulated activity which affect the location and configuration of the regulated activity. There are no aspects of the upland facility in the immediate vicinity of the regulated activity which affect the location and configuration of the regulated activity. Therefore, other factors must be analyzed to assess the extent of federal control and responsibility.

(3) The extent to which the entire Project will be within the Corps jurisdiction. Impacts to potential waters of the U.S. (WUS) constitute 1.4 to 2.2 percent of the 3737 to 7331-acre construction footprints of the alternatives within the Project area and proposed discharges of dredged or fill material into waters of the U.S. represent 59 to 100 percent of all waters of the U.S. (excluding the Poudre and South Platte Rivers, which would not be directly impacted by discharges) within the Project area (from 70.8 of 120.9 acres to 157.8 of 157.8 acres), depending on alternative. Although the extent to which the entire Project is within Corps jurisdiction is minimal, waters are dispersed throughout the entire project area and no project development could occur without a DA permit.

(4) The extent of cumulative Federal control and responsibility. The majority of the Project would occur on private lands, with the exception of a 25-acre parcel on the eastern side of Glade Reservoir that is owned by the Bureau of Land Management (BLM). Therefore, the extent of cumulative federal control and responsibility is limited to the areas of impact to waters of the U.S. and the 25-acre BLM parcel.

Determined Scope: Based on factor three above, sufficient Federal control and responsibility exists to warrant expanding the scope of analysis to include the entire Project area.

Table D-3. Road and utility crossings effects on waters of the U.S.

Project Component	Alternative 1 (acres)	Alternative 2 Reclamation Action Option (acres)	Alternative 2 No Reclamation Action Option (acres)	Alternative 3 (acres)	Alternative 4 (acres)
Roads and utility crossings (permanent and temporary)	982.4	793.0	759.7	1,133.0	1,192.4
WUS at road and utility crossings	22.2	11.5	11.6	20.0	19.8
Percent of WUS at road and utility crossings	2.3%	1.5%	1.5%	1.8%	1.7%
Total project disturbance (permanent and temporary)	3,736.7	4,778.0	4,888.1	7,270.6	7,331.3
Total WUS (permanent and temporary)	71.9	71.3	70.8	157.6	157.8
Percent of total WUS in project disturbance	1.9%	1.5%	1.4%	2.2%	2.2%
Percent of fill in WUS	100%	59%	59%	100%	100%
X acres of the X acres of WUS	71.9 acres of 71.9 acres	71.3 acres of 121.4 acres	70.8 acres of 120.9 acres	157.6 acres of 157.6 acres	157.8 acres of 157.8 acres

2. FINDING OF PRACTICABLE ALTERNATIVES (40 CFR 230.10[a])

This section presents the Corps' analysis of practicable alternatives for the Guidelines evaluation. The Guidelines state:

> *Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.*

The Guidelines define a *practicable alternative* as one that is "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.10 [a][2]). "If it is otherwise a practicable alternative, an area not presently owned by an Applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered" [40 CFR 230.10(a)(2)].

If the proposed activity would involve a discharge into a special aquatic site such as a wetland, the Guidelines distinguish between those projects that are water dependent and those that are not. A water dependent project is one that requires access or proximity to or siting within a special aquatic site to achieve its basic purpose. A non-water dependent project is one that does not require access or proximity to or siting within a special aquatic site to achieve its basic purpose, such as a housing development.

The Guidelines establish a double rebuttable presumption for non-water dependent projects that propose a discharge of fill into a special aquatic site, such as wetlands:

- First, it is presumed that there are practicable alternatives to non-water dependent projects, "unless clearly demonstrated otherwise." [40 CFR 230.10(a)(3)].
- Second, "where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise." [Id. at 230].

The evaluation of the water dependency of the NISP and the availability of practicable alternatives that do not involve special aquatic sites is discussed in Section 2.1.2. After evaluating the water dependency of a proposed project, the Corps must then consider the full range of practicable alternatives that are capable of achieving the overall project purpose. The overall project purpose of the NISP, as defined by the Corps, is discussed in Section 2.1.3. According to the Guidelines, the Corps' consideration of practicable alternatives also should consider:

- Activities which do not involve a discharge of dredged or fill materials into waters of the U.S. or ocean waters; and
- Discharges of dredged or fill material at other locations in waters of the U.S. or ocean waters.

Although all requirements in Section 230.10 must be met, the introduction to Section 230.10(a) recognizes that the level of analysis required "will vary to reflect the seriousness of the potential for adverse impacts on the aquatic environment posed by specific dredged or fill material discharge activities." Furthermore, Regulatory Guidance Letter 93-02 reiterates that the Guidelines afford flexibility to adjust the stringency of the alternatives review to reflect the complexity and extent of the discharge activity. The following alternatives analysis for the proposed project is commensurate with the extent of the discharge activity and the potential for adverse impacts on the aquatic environment.

The alternatives analysis required for the Section 404(b)(1) Guidelines can be conducted either as a separate analysis for 404 permitting or incorporated into the NEPA process. The Corps has integrated NEPA and 404(b)(1) Guidelines into this alternatives analysis. Integration of both NEPA and 404(b)(1) Guidelines ensures that the alternatives selected for evaluation in the NISP EIS provide a reasonable range of alternatives and that the alternatives are practicable.

The EIS alternatives are discussed in Section 2.3. Section 2.4 discusses the practicability analysis methods.

2.1 PROJECT PURPOSE

2.1.1 Basic and Overall Project Purpose

Determining the basic and overall purpose and need for a project are critical steps in evaluating compliance with the Guidelines.

2.1.2 The Corps' Basic Project Purpose and Determination of Water Dependency

The Guidelines require that the Corps determine whether a project is water dependent. The basic project purpose, which is the fundamental, essential, or irreducible purpose of the project, is used by the Corps to determine whether the Applicant's project is water dependent. The basic project purpose for the NISP is to provide water. Providing water in and of itself does not require access or proximity to, or siting within, a special aquatic site to fulfill its "basic purpose." Therefore, the NISP is not water dependent. The discharge of fill material is proposed in special aquatic sites in the project area. Therefore, the rebuttable presumptions described above apply to this assessment.

2.1.3 The Corps' Overall Project Purpose and Alternatives Analysis

The overall project purpose serves as the basis for the Corps 404(b)(1) alternatives analysis and is determined by further defining the basic project purpose in a manner that more specifically describes the applicant's goals for the project, and which allows a reasonable range of alternatives to be analyzed. Under NEPA regulations, alternatives to be evaluated in an EIS must be reasonable. The Guidelines also require evaluation of practicable alternatives. If an alternative does not meet the applicant's need, as determined by the Corps, it may be rejected from further consideration. The Corps regulatory guidelines state:

… The applicant's needs, and the type of project being proposed, should be considered. The overall project purpose should be specific enough to define the applicant's needs, but not so restrictive as to constrain the range of alternatives that must be considered under the 404(b)(1) guidelines.

The overall project purpose of the Project is synonymous with the purpose and need statement for NISP, which was developed jointly by the Corps and District as follows:

To provide the Project Participants with approximately 40,000 acre-feet of new reliable municipal water supply annually through a regional project coordinated by the District, which will meet a portion of the Participants' current and reasonably projected future additional water supply needs.

The basic premise of the Guidelines is that applicants should design proposed projects to meet the overall project purpose while avoiding and minimizing impacts to aquatic environments. This approach is emphasized in the 1990 Memorandum of Agreement between the EPA and the Corps titled "The Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines" (1990 MOA) as modified by the Corps and EPA Final Mitigation Rule (33 CFR Parts 325 and 332 and 40 CFR Part 230). The MOA articulates the Guidelines "sequencing" protocol as first, avoiding impacts; second, minimizing impacts; and third, providing practicable compensatory mitigation for unavoidable impacts to ensure no overall net loss of functions and services.

2.2 ALTERNATIVES DEVELOPMENT

Upon determination of the basic and overall purposes of the NISP, the Corps conducted an alternatives selection process to identify a reasonable range of alternatives with potential to meet the purpose and need of the proposed NISP. Under NEPA, the range of alternatives is governed by the rule of reason, which provides that a decision document is required to set forth those alternatives necessary to permit a reasoned choice. A decision document must consider a reasonable range of alternatives as defined by the specific facts and circumstances of the proposed action. Alternatives must be feasible and consistent with the statement of purpose and need. The range of reasonable alternatives identified by the Corps in the EIS is the starting point for the evaluation of practicable alternatives to the Applicant's proposed Project and

determination whether the Applicant's proposed Project is the LEDPA. The EIS alternative development process is described in Sections 2.2.1 through 2.2.3 below.

2.2.1 Independent Review of NISP Alternatives Evaluation

In 2003, prior to the NISP EIS and as part of the development of a reliable future regional water supply for the Participants, the District studied potential project alternatives (Phase II report, MWH 2004). The Corps' independent analysis of the District's alternatives analysis (MWH 2004) is summarized in Volume I of the Northern Integrated Supply Project EIS Alternatives Evaluation Report (HDR 2007). The development of alternatives considered and evaluated included 16 project concepts and 215 potential elements. Project concepts included potential water supplies able to meet a substantial portion of the NISP Participants' requests. Elements included specific individual projects within a larger strategy or class of potential solutions. Volume II of the Phase II report includes the Corps' independent alternatives analysis, screening process, and action and No Action alternatives selection (HDR 2007).

2.2.2 Alternative Refinement

The Corps determined the District's Phase II report provides a thorough compilation of data and alternatives analysis. The Corps completed further refinement of the alternative screening and selection process to address the requirements of the Guidelines. To comply with the Guidelines, the Corps re-evaluated all of the alternatives identified in the Phase II report, as well as other new alternatives identified subsequent to the Phase II report and during scoping. Additional detail on the Corps' evaluation of alternatives is found in the NISP EIS Alternatives Evaluation Report (HDR 2007). The Corps continued to consider and evaluate potential alternatives subsequent to the DEIS. A new No Action Alternative was developed for the SDEIS (Section 2.4 of the SDEIS) and Alternative 4 from the DEIS was replaced with a new alternative that considered multiple diversion locations on the Poudre River and would divert less water from the Poudre River upstream of Fort Collins (Section 2.7 of the SDEIS). The Corps also evaluated two alternatives proposed in comments on the DEIS (Sections 2.2.5 and 2.2.6 of the SDEIS).

2.2.3 Alternative Screening

To ensure the alternatives analysis met the requirements of the Guidelines, the Corps reviewed the screening criteria used in the 2007 NISP EIS Alternatives Evaluation Report (HDR 2007). The Corps eliminated timeliness under the purpose and need screening category and reevaluated the alternatives for the land use criterion in the practicable screening category (Section 2.2.3 of the SDEIS).

2.2.4 On-site Alternatives

In the DEIS, the Corps evaluated one on-site alternative to the proposed project (Alternative 2): Glade Reservoir and SPWCP with Agricultural Transfers. Subsequent to the DEIS, this alternative was eliminated and the concept of transferring agricultural water rights was incorporated into a new No Action Alternative in the SDEIS.

2.2.5 Off-site Alternatives

As required by the Guidelines, the Corps evaluated alternative project sites to determine if there is an alternative site available on which the proposed Project could be constructed that would involve fewer impacts to aquatic resources than the proposed Project and would not have additional associated adverse impacts to other sensitive resources such as listed species or cultural resources. Alternative sites were subject to a detailed evaluation of the key siting criteria required for similarly sized water storage projects. After a detailed evaluation using all the above siting criteria, two feasible off-site alternatives were identified. These alternatives were considered as part of the 404(b)(1) alternatives analysis.

2.3 ALTERNATIVES RECOMMENDED FOR FURTHER ANALYSIS IN THE EIS

Based on information submitted by the Applicant as part of the application for a DA permit, and based on its own independent review, the Corps has completed the identification and evaluation of alternatives for the proposed NISP. The Corps has identified the following four alternatives for further analysis in the EIS:

- No Action Alternative (Alternative 1) – Cactus Hill Reservoir (120,000 AF) and Agricultural Water Transfer
- Alternative 2 – Glade Reservoir (170,000 AF) and the South Platte Water Conservation Project (SPWCP) (Proposed Action and District's Preferred Alternative)
- Alternative 3 – Cactus Hill Reservoir (190,000 AF), Poudre Valley Canal Diversion, and the SPWCP
- Alternative 4 – Cactus Hill Reservoir (190,000 AF), Multiple Diversion Locations, and the SPWCP

2.4 PRACTICABILITY OF ALTERNATIVES

2.4.1 Practicability Criteria

Per 40 CFR 230.10(a)(2) an alternative is "practicable" if "it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall

project purposes." The following criteria were used to screen the practicability of on-site alternatives.

2.4.2 Overall Project Purpose

To be practicable, an alternative must meet the overall project purpose. The overall project purpose of the Project is synonymous with the purpose and need statement for NISP, which is "to provide the Project Participants with approximately 40,000 acre-feet of new reliable municipal water supply annually through a regional project coordinated by the District, which will meet a portion of the Participants' current and reasonably projected future additional water supply needs." Project concepts and elements were screened using three purpose and need criteria: firm yield, timeliness, and regional project. Subsequent to the DEIS, the Corps eliminated timeliness under the purpose and need screening criteria. Firm yield and regional project were retained as screening criteria in the SDEIS.

2.4.3 Cost Criteria

A cost screen was not used in the DEIS alternatives selection process because it was determined that information on costs that could render an alternative not practicable were not available and were unlikely to help differentiate alternatives at this stage in the screening process. Subsequent to the DEIS, cost estimates were developed for the four alternatives and evaluated in the SDEIS. Table D-4 presents the estimated costs of the alternatives in 2010 dollars and the cumulative projected capital costs over a 13-year project development period, including projected inflation. The estimated costs for Alternative 2 – Reclamation Action Option do not include payments to Reclamation for the contract and special use permit. None of the SDEIS alternatives were eliminated based on cost.

Table D-4. NISP estimated alternative costs (2010 dollars).

Item	Alternative 1 — No Action Alternative	Alternative 2 — Glade Reservoir and the SPWCP (Proposed Action)		Alternative 3 — Cactus Hill Reservoir, Poudre Valley Canal Diversion, and SPWCP	Alternative 4 — Cactus Hill Reservoir, Multiple Diversion Locations, and SPWCP
		Reclamation Action	No Reclamation Action		
Capital Costs					
New Storage Reservoir Cactus Hill: Alts 1, 3, and 4 Glade + Forebay: Alt 2	$145,503,000	$222,138,000	$222,138,000	$229,506,000	$229,506,000
Glade to Horsetooth (Reclamation Action Option) Carter Pipeline (no Reclamation Action Option)	$0	$8,553,000	$84,460,000	$0	$0
Conveyance to Reservoirs	$52,477,000	$5,851,000	$5,851,000	$103,236,000	$144,843,000
Conveyance to Participants	$117,682,000	$8,553,000	$84,460,000	$144,536,000	$144,536,000
Munroe Canal Bypass	$0	$36,423,000	$36,423,000	$0	$0
Galeton Reservoir	$0	$54,140,000	$54,140,000	$54,140,000	$54,140,000
SPWCP Infrastructure	$0	$127,253,000	$127,253,000	$127,253,000	$127,253,000
Advanced Water Treatment	$56,500,000	$0	$0	$0	$0
Water Rights Acquisition, Legal and Revegetation	$350,000,000	$0	$0	$1,000,000	$1,000,000
U.S. 287 Realignment	$0	$44,914,600	$44,914,600	$0	$0
Total	**$722,162,000**	**$507,825,600**	**$659,639,600**	**$659,671,000**	**$701,278,000**
Annual Costs					
Operations and Maintenance (annual cost)	$1,706,000	$2,165,000	$2,542,000	$3,007,000	$3,214,000
Pumping Power Cost (annual cost)	$2,438,000	$2,663,000	$4,291,000	$4,135,000	$4,511,000
Reclamation Contract and Permit (annual cost)	$0	*See note	$0	$0	$0
Projected Cumulative Nominal Costs over a 13-Year Project Development Period					
	$1,372,688,000	**$718,257,000**	**$932,979,000**	**$933,024,000**	**$991,872,000**

Source: ERO 2014, BBC and HCR 2014.

*Note: The estimated costs for Alternative 2 – Reclamation Action Option do not include payments to Reclamation for the contract and special use permit or the increased costs of pumping water into Carter Lake, which are unknown at this time.

2.4.4 Existing Technology Criteria

The existing technology criterion considered whether elements, concepts, and alternatives would be able to be constructed using a proven technology and managed using proven practices. Any component not capable of utilizing proven technology to provide the required firm yield was eliminated from further evaluation. The Guidelines do not require the Corps or applicant to evaluate alternative project types that would not meet the overall project purpose.

2.4.5 Logistics Criteria

The logistics criteria considered land use, geographic location, element capacity, and whether the water resources or infrastructure components for NISP would lie within areas known to be integral to the development of other entities. Subsequent to the DEIS, the Corps determined sites currently managed for local open space would be available for NISP and consequently the Corps eliminated the local open space factor under the land use criteria. The remaining criteria were retained as screening criteria in the SDEIS.

2.4.6 Practicability of SDEIS Alternatives

This discussion focuses on the four alternatives evaluated in the SDEIS. At the landscape level, Alternative 3 (Cactus Hill Reservoir, Poudre Valley Canal Diversion, and SPWCP) and Alternative 4 (Cactus Hill Reservoir, Multiple Diversion Locations, and SPWCP) are similar. Both would involve construction of the 190,000 AF Cactus Hill Reservoir and the 45,624 AF Galeton Reservoir. Alternative 1 would also involve the construction of a new Cactus Hill Reservoir, but at a smaller size than Alternatives 3 and 4 (120,000 AF vs. 190,000 AF). Alternatives 3 and 4 were considered to evaluate whether any measureable environmental benefit would be realized as compared to the proposed project. Both Alternatives 3 and 4 would result in relatively equal or similar direct impacts to waters of the U.S., known cultural resources, high plains vegetation, and ESA habitat, with differences in most impacts being less than five percent and all being less than ten percent. Alternatives 3 and 4 would result in different indirect impacts to waters of the U.S. as Poudre River flow would be diverted at multiple locations under Alternative 4, resulting in less flow being diverted upstream of the Fort Collins area, which has a trout fishery that is growing in popularity for recreational fishing and numerous natural areas associated with the river.

Table D-5. Practicability of alternatives analyzed in the NISP SDEIS.

Practicability Criteria	Alternative 1 (No Action Alternative)	Alternative 2	Alternative 3	Alternative 4
Project Purpose	40,000 AF firm yield	40,000 AF firm yield	40,000 AF firm yield	40,000 AF firm yield
Meets Project Purpose	No*	Yes	Yes	Yes
Existing Technology Criteria				
Meets Technology Criteria	Unknown	Yes	Yes	Yes
Logistics Criteria				
Land Use	Yes	Yes	Yes	Yes
Geographic Location	Yes	Yes	Yes	Yes
Element Capacity	Yes	Yes	Yes	Yes
Integral to Other Development Plans?	No	No	No	No
Cost Criteria				
Reasonable Cost for Similar Character Project?	Yes	Yes	Yes	Yes
Practicability Conclusion				
Practicable Alternative?	No	Yes	Yes	Yes

*This alternative does not meet the Applicant's purpose. The 15 Participants would pursue this alternative, either individually or collectively, without the Applicant.

2.5 PRACTICABILITY ANALYSIS FINDINGS AND CONCLUSIONS

2.5.1 Alternative 1. No Action Alternative – Cactus Hill Reservoir (120,000 AF) and Agricultural Water Transfer

The No Action Alternative would not achieve the overall project purpose. However, NEPA requires evaluation of a No Action Alternative and therefore it was retained in the SDEIS.

2.5.2 Alternative 2. Glade Reservoir (170,000 AF) and SPWCP

Alternative 2 is the Proposed Action and the District's Preferred Alternative. This alternative meets the overall project purpose, existing technology, and logistics criteria and, therefore, is practicable. However, until the Phase II water quality modeling has been completed it cannot be determined whether this alternative would result in greater impacts to the aquatic environment than the other alternatives analyzed in the SDEIS. Whether this alternative is the LEDPA as defined by the Guidelines is unknown at this time.

2.5.3 Alternative 3. Cactus Hill Reservoir (190,000 AF), Poudre Valley Canal Diversion, and SPWCP

This alternative meets the overall project purpose, existing technology, and logistics criteria and, therefore, is practicable. However, until the Phase II water quality modeling has been completed it cannot be determined whether this alternative would result in greater impacts to the aquatic environment than the other alternatives analyzed in the SDEIS. Whether this alternative is the LEDPA as defined by the Guidelines is unknown at this time.

2.5.4 Alternative 4. Cactus Hill Reservoir (190,000 AF), Multiple Diversion Locations, and SPWCP

This alternative meets the overall project purpose, existing technology, and logistics criteria and, therefore, is practicable. However, until the Phase II water quality modeling has been completed it cannot be determined whether this alternative would result in greater impacts to the aquatic environment than the other alternatives analyzed in the SDEIS. Whether this alternative is the LEDPA as defined by the Guidelines is unknown at this time.

2.5.5 Conclusions

The No Action Alternative (Alternative 1) does not meet the project purpose and, therefore, is not practicable. Alternatives 3 and 4 would have similar effects to aquatic resources as Alternative 2, the Proposed Action. At this time it cannot be determined whether these alternatives are less environmentally damaging practicable alternatives to the Proposed Action. Water quality modeling will be completed prior to the FEIS and the results of that analysis will be a critical component of determining the LEDPA. Impacts of the alternatives on the physical, chemical, and biological components of the aquatic environment are presented and discussed in Section 4 of this document.

3. RESTRICTIONS ON DISCHARGE (40 CFR 230.10[b])

The Guidelines require consideration of specific impacts that may warrant additional restrictions on discharge. No discharge of dredged or fill material may be permitted if it will:

1. Cause or contribute to violations of any applicable State water quality standard.
2. Violate any applicable toxic effluent standard or prohibition under Section 307 of the CWA.
3. Jeopardize the continued existence of species listed as endangered or threatened under the ESA of 1973 (ESA), or result in the potential for adverse impacts (destruction or adverse modification) of a habitat which is determined by the Secretary of the Interior or Commerce to be a critical habitat under the ESA. If an exemption has been granted by the Endangered Species Committee, the terms of the exemption shall apply, in lieu of this paragraph.
4. Violate any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972.

The Corps has not yet made a determination regarding compliance of the Applicant's proposed Project with the restrictions on discharge. Water quality modeling will be completed prior to the FEIS and the results of that analysis will be a critical component in determining whether the proposed Project would cause or contribute to violations of State water quality standards. An assessment of known and potential hazardous materials sites is presented in Section 4.21 of the SDEIS and will be used in part to determine whether the proposed Project would violate toxic effluent standards or prohibitions. The USFWS issued a Biological Opinion (BO) on October 5, 2007 for the Proposed Action. However, since issuance of the BO, changes have been made to the Proposed Action that could affect this determination. The Corps will prepare a Supplemental Biological Assessment that addresses changes to the District's Preferred Alternative that could have effects on federally listed threatened or endangered species and their designated critical habitat and will reinitiate consultation with the USFWS under Section 7 of the ESA. These actions will take place prior to issuance of the FEIS or a Record of Decision. Given its inland location, the proposed NISP would not affect any marine sanctuaries.

A determination of whether the proposed Project meets the standards listed above will be included in the ROD.

4. FINDING OF NO SIGNIFICANT DEGRADATION (40 CFR 230.10[c])

The Guidelines require consideration of the potential for the proposed discharge to cause or contribute to the degradation of waters of the U.S. Except as provided under Section 404(b)(2), discharge of dredged or fill material that would cause or contribute to significant degradation of waters of the U.S. is not permitted. Effects that may, either individually or collectively, contribute to the significant degradation of waters of the U.S. include:

1. Significant adverse effects of discharge of pollutants on human health or welfare, through pollution of municipal water supplies, fish, shellfish, wildlife and special aquatic sites
2. Significant adverse effects of discharge of pollutants on life stages of aquatic wildlife and other wildlife dependent on aquatic ecosystems, to include the transfer, concentration, and spread of pollutants or their byproducts outside of the disposal site through biological, physical, and/or chemical processes
3. Significant adverse effects of discharge of pollutants on aquatic ecosystem diversity, productivity, and stability including but not limited to the loss of fish and wildlife habitat, or the loss of the capacity of wetland to assimilate nutrients, purify water, or reduce wave energy
4. Significant adverse effects of discharge of pollutants on recreational, aesthetic, and/or economic values

The scope of the Corps' analysis under 40 CFR 230.10(c) considers the direct effects of the discharge of dredged or fill material and the indirect effects that are associated with the discharge. In the case of NISP, the scope of the Corps' analysis includes the effects of project operations on flow-related resources. The Corps has not yet made a determination regarding compliance of the Applicant's proposed Project with the no significant degradation mandate. The determination of whether the Applicant's proposed Project would cause or contribute to significant degradation of waters of the U.S. will consider the conclusions in the Factual Determinations (Subpart B) and the Evaluation of Dredged or Fill Material (Subpart G). The conclusions of these two analyses also consider the detailed evaluation of impacts on specific physical, chemical, biological, and human characteristics of the aquatic ecosystem found in Subparts C through F. The determination of compliance also will consider the "Actions to Minimize Adverse Effects" found in Subpart H.

A determination of whether the proposed Project would cause or contribute to the significant degradation of waters of the U.S. will be included in the ROD.

5. MINIMIZATION OF POTENTIAL ADVERSE IMPACTS (40 CFR 230.10[d])

The Guidelines require consideration of the extent to which steps have been taken to minimize potential adverse effects. Except as provided under Section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

The Corps has not yet made a determination regarding whether the Applicant's proposed Project complies with the mandate to minimize potential adverse impacts. The determination will consider the minimization measures identified in "Actions to Minimize Adverse Effects" (Subpart H). The Applicant has identified several potential measures to minimize adverse impacts. These measures are described in the Applicant's Conceptual Mitigation Plan, which is provided as Appendix F to the SDEIS (available at: http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado/EISNISP).

The Corps has reviewed the minimization measures proposed by the Applicant and considers them to be a reasonable starting point for developing the list of all appropriate and practicable steps that can be taken to minimize the potential adverse impacts of the proposed Project. A determination of whether the Applicant's proposed minimization actions are sufficient to minimize potential adverse effects on the discharge to the aquatic ecosystem will be included in the ROD.

6. SUMMARY OF FINDINGS OF COMPLIANCE

This document constitutes a draft of the Corps' evaluation of the NISP's compliance with the Guidelines. The Corps' findings of compliance described in Chapter 2, "Finding of Practicable Alternatives (40 CFR 230.10 [a])"; Chapter 3, "Restrictions on Discharge (40 CFR 230.10 [b])"; Chapter 4, "Finding of No Significant Degradation (40 CFR 230.10 [c])"; and Chapter 5, "Minimization of Potential Adverse Effects (40 CFR 230.10 [d])" will be considered in the development of the final determination, which will be presented in the ROD.

As discussed in Chapter 1, the Corps will not finalize its compliance determination regarding the Applicant's DA permit application until after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS. The Corps will prepare a ROD describing its decision on the permit application and its determination of whether the Applicant's proposed Project complies with the Guidelines.

7. SUBPART B: COMPLIANCE WITH THE GUIDELINES

7.1 RESTRICTIONS ON DISCHARGE (40 CFR 230.10)

See Section 3 for a preliminary evaluation.

7.2 FACTUAL DETERMINATIONS (40 CFR 230.11)

7.2.1 Physical Substrate Determinations (40 CFR 230.11[a])

Physical substrate determinations include considering the effects of the proposed Project, individually and cumulatively, on the substrate in the study area. The overall NISP study area and alternative Affected Environment study areas are described in Section 3.1.1 of the SDEIS. Considerations include the physical characteristics of the material proposed for discharge, the material constituting the substrate at the disposal site, alterations in streamflow, and potential changes in substrate elevation and bottom contours, including changes outside of the disposal site that may occur as a result of erosion, compaction, or other movement of the discharged material. The duration and physical extent of substrate changes also are considered. The following sections of the DEIS and SDEIS describe existing characteristics of the substrate in the Project area:

DEIS

- 3.8 and 3.27.2 Geology
- 3.9 and 3.27.4 Soils
- 3.12 and 3.27.5 Wetlands and Other Waters
- 3.15 Fish and Other Aquatic Life

SDEIS

- 3.6 Geology
- 3.7 Soils
- 3.9 Wetlands, Riparian Resources, and Other Waters
- 3.12 Aquatic Biological Resources

Information regarding the impacts of proposed Project activities on physical substrate in the study area is found in the following sections of the DEIS and SDEIS:

DEIS

- 4.8 and 4.29.1 Geology
- 4.9 and 4.29.3 Soils
- 4.12 and 4.29.5 Wetlands and Other Waters
- 4.15 Fish and Other Aquatic Life

SDEIS

- 4.6 Geology
- 4.7 Soils
- 4.9 Wetlands, Riparian Resources, and Other Waters
- 4.12 Aquatic Biological Resources

A factual determination of impacts on substrate will be based on the impact analyses included in the "Findings of Subparts C through F" and "Findings of Subpart H: Actions to Minimize Adverse Effects" sections of this document and the analysis of impacts in the DEIS, SDEIS, and FEIS.

7.2.2 Water Circulation, Fluctuation, and Salinity Determinations (40 CFR 230.11[b])

Water circulation, fluctuation, and salinity determinations include consideration of the effect of the proposed Project, individually and cumulatively, on freshwater circulation and current patterns in rivers, creeks, and streams in the study area. Consideration is given to the potential diversion or obstruction of flow, alterations of bottom contours, or other significant changes in the hydrologic regime such as alteration of the rate of groundwater inflows, surface runoff, and stream flow. The following sections of the DEIS and SDEIS describe the existing freshwater hydrology, including freshwater circulation and current patterns in rivers, creeks, and streams in the study area and groundwater inflows:

DEIS	SDEIS
• 3.3 Surface Water	• 3.2 Surface Water
• 3.7 Groundwater	• 3.5 Ground Water

Information regarding the impacts of proposed Project activities on freshwater circulation and current patterns in the study area is found in the following sections of the DEIS and SDEIS:

DEIS	SDEIS
• 4.3 Surface Water	• 4.2 Surface Water
• 4.7 Groundwater	• 4.5 Ground Water

A factual determination of impacts on water circulation, fluctuation, and salinity will be based on the technical evaluation factors findings in Subparts C through F, on the proposed actions for minimizing effects found in Subpart H, and the analysis of impacts in the DEIS, SDEIS, and FEIS.

7.2.3 Suspended Particulates and Turbidity Determinations (40 CFR 230.11[c])

Suspended particulates and turbidity determinations will include considering the effect of the proposed Project, individually and cumulatively, on suspended particulates and turbidity in waters in the vicinity of the disposal site. Consideration shall be given to the grain size of the material proposed for discharge, the shape and size of the plume of suspended particulates, the duration of the discharge and resulting plume and whether or not the potential changes will cause violations of applicable water quality standards. Consideration should also be given to the possible loss of environmental values (Sec. 230.21) and to actions for minimizing impacts (Subpart H). The fill material at the disposal site might result in temporary suspension of

particulates and resultant turbidity, but with the issuance of a Section 401 Water Quality Certification and Best Management Practices, it is expected that there should not be in any deleterious, permanent impacts. The fill materials would consist of concrete placed in forms, rocks, boulders and soil from upland borrow areas. Any local sediment added to the water column should be of a transitory nature posing no adverse consequences.

7.2.4 Contaminant Determinations (40 CFR 230.11[d])

Hazardous waste and hazardous materials are defined as substances or industrial byproducts that are destructive to the environment, unsafe to handle, and harmful to humans and animals. Runoff from improperly stored, transported, or disposed of hazardous materials and waste can contaminate wetlands and other waters of the United States, contaminate groundwater, and harm wildlife. For the proposed Project, there are known hazardous sites that have the potential to contribute to discharge of contaminants. The factual determinations within the Guidelines require a determination of the degree to which the material proposed for discharge could introduce, relocate, or increase contaminants. This determination considers the material to be discharged, the aquatic environment at the proposed disposal site, and the availability of contaminants. Information regarding the character of the materials proposed for discharge and the potential for contamination in the study area can be found in the following sections of the DEIS and SDEIS:

DEIS	SDEIS
• 3.23 and 3.27.15 Hazardous Sites	• 3.21 Hazardous Materials

Information regarding the impacts of proposed Project activities on contaminants in the study area is found in the following sections of the DEIS and SDEIS:

DEIS	SDEIS
• 4.23 and 4.29.17 Hazardous Sites	• 4.21 Hazardous Materials

The determination of the potential for contamination will be based on the evaluation of dredged and fill material conducted as part of the "Evaluation of Dredged or Fill Material" in Subpart G of this document and the analysis of impacts in the DEIS, SDEIS, and FEIS.

7.2.5 Aquatic Ecosystems Structure and Function Determinations (40 CFR 230.11[e])

Determinations of aquatic ecosystem structure and function require consideration of potential changes in substrate characteristics and elevation, water quality, water circulation and fluctuations, and the potential effects of such changes on aquatic organisms or communities. The aquatic ecosystems in the study area support aquatic and wetland vegetation, fish, invertebrates, mammals, reptiles, amphibians, freshwater mussels, and birds. The Poudre River is not high quality habitat for mussels and they only occur in low numbers if they do occur. No mussels were collected during fish surveys conducted in 2005 (GEI 2013), and the negligible effects on

mussels are not discussed in the SDEIS. The following sections of the DEIS and SDEIS describe the existing structure and function of the aquatic ecosystem in the study area:

DEIS

- 3.3 Surface Water
- 3.4 Stream Morphology
- 3.5 Surface Water Quality
- 3.7 Ground Water
- 3.9 and 3.29.3 Soils
- 3.12 and 3.29.5 Wetlands and Other Waters
- 3.13 and 3.29.6 Riparian Resources
- 3.14 and 3.29.7 Wildlife
- 3.15 Fish and Other Aquatic Life
- 3.16 and 3.29.8 Species of Concern

SDEIS

- 3.2 Surface Water
- 3.3 Surface Water Quality
- 3.4 Stream Morphology and Sediment Transport
- 3.5 Ground Water
- 3.7 Soils
- 3.9 Wetlands, Riparian Resources, and Other Waters
- 3.10 Wildlife
- 3.11 Special Status Species
- 3.12 Aquatic Biological Resources

Information regarding the impacts of proposed Project activities on the structure and function of the aquatic ecosystem in the study area is found in the following sections of the DEIS and SDEIS:

DEIS

- 4.3 Surface Water
- 4.4 Stream Morphology
- 4.5 Surface Water Quality
- 4.7 Ground Water
- 4.9 and 4.29.3 Soils
- 4.12 and 4.29.5 Wetlands and Other Waters
- 4.13 and 4.29.6 Riparian Resources
- 4.14 and 4.29.7 Wildlife
- 4.15 Fish and Other Aquatic Life
- 4.16 and 4.29.8 Species of Concern

SDEIS

- 4.2 Surface Water
- 4.3 Surface Water Quality
- 4.4 Stream Morphology and Sediment Transport
- 4.5 Ground Water
- 4.7 Soils
- 4.9 Wetlands, Riparian Resources, and Other Waters
- 4.10 Wildlife
- 4.11 Special Status Species
- 4.12 Aquatic Biological Resources

The determination of the potential effects of the discharge on aquatic ecosystems will be based on the impact analyses in the DEIS, SDEIS, and FEIS and also may include information based on the "Evaluation of the Dredged or Fill Material" in Subpart G.

7.2.6 Proposed Disposal Site Determination (40 CFR 230.11[f])

The proposed disposal sites for dredged and fill materials are described in detail in Chapter 2 of the SDEIS and the Applicant's DA permit application (District 2008).

All of the action alternatives would involve the discharge of fill material into portions of streams, canals, and in depressional and riverine wetland areas. Indirect impacts could result from diversion of streams, reductions in runoff or stream flow, alteration of the existing flow regimes,

alteration of the stream morphology or structure, and changes to water quality. Impacts from the proposed Project would result from dam and associated facility construction and construction of the conveyance systems which would deliver water to the NISP Participants. The location of the proposed disposal sites within the Glade, Galeton, and Cactus Hill reservoir study areas can be seen in Figures 2-2, 2-5, and 2-6 of the SDEIS, respectively. The conveyance system alignments will be refined between the SDEIS and FEIS, and information regarding proposed disposal sites within the alignments will be presented in the updated 404(b)(1) analysis that will be included in the FEIS.

The Guidelines state that the mixing zone associated with each specific disposal site shall be confined to the smallest practicable area consistent with the type of discharge dispersion. As part of this determination, the Corps must evaluate the acceptability of the proposed disposal sites and mixing zone based on the following factors:

- Depth of water at the disposal site
- Current velocity, direction, and variability at the disposal site
- Degree of turbulence
- Stratification resulting from causes such as obstructions or salinity, or density profiles at the disposal site
- Discharge vessel speed and direction, if appropriate
- Rate of discharge
- Ambient concentration of constituents of interest
- Fill material characteristics, including concentrations of constituents, amount of material, type of material, and settling velocities
- Number of discharge actions per unit time
- Other factors of the disposal site that affect the rates and patterns of mixing

The following sections of the DEIS and SDEIS provide information regarding existing conditions at the proposed disposal sites:

DEIS

- 3.3 Surface Water
- 3.4 Stream Morphology
- 3.5 Surface Water Quality
- 3.9 and 3.27.4 Soils
- 3.23 and 3.27.15 Hazardous Sites

SDEIS

- 3.2 Surface Water
- 3.3 Surface Water Quality
- 3.4 Stream Morphology and Sediment Transport
- 3.7 Soils
- 3.9 Wetlands, Riparian Resources, and Other Waters
- 3.21 Hazardous Materials

Information regarding the impacts of proposed Project activities on the proposed disposal sites in the study area is found in the following sections of the DEIS and SDEIS:

DEIS

- 4.3 Surface Water
- 4.4 Stream Morphology
- 4.5 Surface Water Quality
- 4.9 and 4.29.3 Soils
- 4.23 and 4.29.17 Hazardous Sites

SDEIS

- 4.2 Surface Water
- 4.3 Surface Water Quality
- 4.4 Stream Morphology and Sediment Transport
- 4.7 Soils
- 4.9 Wetlands, Riparian Resources, and Other Waters
- 4.21 Hazardous Materials

The factual determination of the potential effects on the proposed disposal sites will be based on the findings of Subparts C and H and the impact analyses found in the DEIS, SDEIS, and FEIS.

7.2.7 Determination of Cumulative Effects on the Aquatic Ecosystem (40 CFR 230.11[g])

Cumulative effects on the aquatic ecosystem include changes that are attributable to the collective effect of activities associated with the proposed Project and other past, present, and reasonably foreseeable future actions (RFFAs) in the study area. The cumulative effect of numerous actions can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems. Criteria used in identifying cumulatively affected resources include whether (1) the resource is especially vulnerable to incremental impacts; (2) other similar actions in the same geographic area may result in similar impacts on the resource; (3) impacts have been historically significant for the resource; and (4) cumulative impact concerns have been previously analyzed and identified. A determination of cumulative impacts that may result from the proposed Project should be evaluated to the extent reasonable and practical. A review of past, present, and RFFAs indicates that cumulative impacts would result primarily from changes to general economic drivers, land use, agriculture, urban and industrial development (including oil and gas development), channel and aquatic habitat modification, and water resources development.

See Section 4.28 of the DEIS and Chapter 5, "Cumulative Effects" of the SDEIS for a description of past, present, and RFFAs in the study area. The determination of cumulative effects on the aquatic ecosystem will be based on the DEIS, SDEIS, and FEIS impact analyses, with consideration for impacts discussed in Subparts D and E.

7.2.8 Determination of Secondary Effects on the Aquatic Ecosystem (40 CFR 230.11[h])

In addition to direct impacts associated with the proposed Project, secondary effects may be experienced by wetlands and other waters of the United States from changes in hydrology, water quality, thermal regimes, and habitat. Project-related activities that alter hydrology to the extent that wetlands are no longer inundated or saturated at a frequency or duration sufficient to support

hydrophytic vegetation would result in partial or permanent loss of wetland resources. The extent of impact associated with hydrologic changes depends on baseline conditions (e.g., hydrologic regimes, wetland types, soils, and geology), proximity to dewatering activities, and the duration of dewatering activities. As described in Section 3.12 of the DEIS and Section 3.9 of the SDEIS, the wetlands in the Project area primarily consist of depressional wetlands that are surface water and groundwater driven and riverine wetlands that receive hydrology from streams. Changes in groundwater flows and reduced river flows could result in adverse impacts on hydrology and the overall health of the wetland systems and any receiving waterbodies (streams). Altered streamflows can affect residence time, reaeration rates, and kinetic rates that influence dissolved oxygen (DO), pH, and eutrophication in streams and wetlands. Introduction of Project-generated dust and contaminants also may result in secondary effects on wetlands and aquatic ecosystems. Disturbance of wildlife populations by noise or human activity also can result in changes to the biotic component of aquatic ecosystems.

The following sections of the DEIS and SDEIS contain detailed analyses of potential secondary impacts on the aquatic ecosystem:

DEIS

- 4.3 Surface Water
- 4.4 Stream Morphology
- 4.5 Surface Water Quality
- 4.7 Ground Water
- 4.9 and 4.29.3 Soils
- 4.12 and 4.29.5 Wetlands and Other Waters
- 4.13 and 4.29.6 Riparian Resources
- 4.14 and 4.29.7 Wildlife
- 4.15 Fish and Other Aquatic Life
- 4.16 and 4.29.8 Species of Concern
- 4.23 and 4.29.17 Hazardous Sites

SDEIS

- 4.2 Surface Water
- 4.3 Surface Water Quality
- 4.4 Stream Morphology and Sediment Transport
- 4.5 Ground Water
- 4.7 Soils
- 4.9 Wetlands, Riparian Resources, and Other Waters
- 4.10 Wildlife
- 4.11 Special Status Species
- 4.12 Aquatic Biological Resources
- 4.21 Hazardous Materials

The factual determination of secondary effects will be based on the impact analyses in the DEIS, SDEIS, and FEIS and on the analyses found in Subparts D and E.

8. SUBPART C: POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ENVIRONMENT

8.1 SUBSTRATE (40 CFR 230.20)

The substrate of the aquatic ecosystem includes sediments that underlie open waters of the United States and hydric soils that constitute the surface of wetlands. Substrate consists of organic and inorganic solid materials, and includes water and other liquids or gases that occupy the pore space in the sediment or soil. The following sections of the DEIS and SDEIS describe the existing characteristics of the substrate in the Project area:

DEIS

- 3.4 Stream Morphology
- 3.9 Soils
- 3.15 Fish and Other Aquatic Life

SDEIS

- 3.4 Stream Morphology and Sediment Transport
- 3.7 Soils
- 3.12 Aquatic Biological Resources

The substrate on which proposed fill may be placed is located in stream channels and depressional and riverine wetland areas. The substrate of the Poudre River within the Project area varies from silt to boulders with coarser cobble and gravel substrate more common in upstream sections and silt and sand more common in sections downstream of Interstate 25. The substrate of depressional wetlands within the project area ranges from rock outcrops to clay loams (ERO 2008a). The substrate of riverine wetlands along the Poudre River ranges from silts to boulders covered by fine sediment.

8.1.1 Potential Impacts

Potential Project-related impacts on substrate include direct impacts from filling of portions of streams, and depressional and riverine wetland areas. Indirect impacts on substrate could result from diversion of streams, alteration of the existing flow regimes, alteration of the stream morphology or structure, and changes to water quality. Impacts on substrate from the proposed Project would result from construction of dams and associated facilities and conveyance systems. These impacts are discussed in the following sections of the DEIS and SDEIS:

DEIS	SDEIS
• 3.3 Surface Water	• 4.2 Surface Water
• 3.4 Stream Morphology	• 4.3 Surface Water Quality
• 3.5 Surface Water Quality	• 4.4 Stream Morphology and Sediment Transport
• 3.9 Soils	• 4.7 Soils
• 3.12 Wetlands and Other Waters	• 4.9 Wetlands, Riparian Resources, and Other Waters
• 3.15 Fish and Other Aquatic Life	• 4.12 Aquatic Biological Resources

The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

8.2 SUSPENDED PARTICULATES AND TURBIDITY (40 CFR 230.21)

Suspended particulates in the aquatic ecosystem consist of fine-grained mineral particles, usually smaller than silt, and organic particles. Suspended particulates are quantified by the measurement of total suspended solids (TSS, measured as milligrams per liter (mg/L)) and by turbidity which provides a measure of water clarity measured as Nephelometric Turbidity Units (NTU). Suspended particulates may enter water bodies as a result of land runoff, flooding, vegetative and planktonic breakdown, re-suspension of bottom sediments, and human activities including dredging and filling. Particulates may remain suspended in the water column for variable periods of time as a result of such factors as agitation of the water mass, particulate specific gravity, particle shape, and physical and chemical properties of particle surfaces. The NISP EIS (Corps 2008), the South Platte River near Kersey Stream Morphology Technical Report (ERO 2008b), the Water Quality Technical Report (ERO and HDR 2008), and the Cactus Hill Reservoir Salinity Model Technical Report (ERO 2008c) contain detailed information about effects to suspended particulates and turbidity.

The discharge of dredge or fill material can result in greatly elevated levels of suspended particulates in the water column for varying lengths of time. These new levels may reduce light penetration and lower the rate of photosynthesis and the primary productivity of an aquatic area if they last long enough. Sight dependent species may suffer reduced feeding ability leading to limited growth and lowered resistance to disease if high levels of suspended particulates persist. The biological and the chemical content of the suspended material may react with the dissolved oxygen in the water, which can result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine grained particulates in the material may become biologically available to organisms either in the water column or on the substrate. Significant increases in suspended particulate levels create turbid plumes that are highly visible and aesthetically displeasing. The extent and persistence of these adverse impacts caused by discharges depend upon the relative increase in suspended particulates above the amount occurring naturally; the duration of the higher levels; the current patterns, water level, and

fluctuations present when such discharges occur; the volume, rate, and duration of the discharge; particulate deposition; and the seasonal timing of the discharge.

The Common Technical Platform Water Quality Baseline Report (ERO 2012) contains information on historic TSS and turbidity values in the Poudre and South Platte rivers. In general, TSS and turbidity values are lowest in the upper reaches of the Poudre River area at the Poudre Valley Canal. Suspended particulates typically increase from the mouth of the Poudre Canyon downstream to the confluence with the South Platte River, particularly near agricultural discharge locations. Seasonal data indicates higher TSS and turbidity values during peak runoff in June when flows are high and lower values in the shoulder season and periods of low flow.

8.2.1 Potential Impacts

Project-related impacts on suspended particles and turbidity may occur during the entire life cycle of the Project, including the construction and operations phases. Impacts may occur from land disturbance activities, channel modifications, Project diversions and operations, and implementation of mitigation measures. Project-related impacts on suspended particles and turbidity could result from watershed alterations, additional loading of contaminants, water withdrawals and discharges, stormwater runoff, alteration of groundwater contributions, and clearing and industrial activity.

Construction of new reservoirs under all of the alternatives would result in discharges that may increase suspended particulates in tributary drainages and possibly the Poudre River or other receiving streams. Best management erosion and sediment control measures would typically minimize the introduction of sediments into receiving waters during construction activities.

All of the alternatives would result in additional diversions from the Poudre River and the action alternatives include diversions from the South Platte River. Diversions into Glade, Cactus Hill, and Galeton reservoirs under the various alternatives would remove part of the sediment load from the Poudre and South Platte Rivers. Some suspended particulates would settle out in the reservoirs, while finer particles could remain in suspension. Reservoirs also have the potential to introduce suspended particulates from shoreline erosion and biological activity. None of the alternatives would involve direct discharges to the Poudre or South Platte Rivers, with the exception of deliveries to the Poudre River from Glade Reservoir under Alternative 2. Releases from Glade Reservoir to the Poudre River are expected to have TSS and turbidity values similar to the river and use of a multi-level outlet at Glade Reservoir would be used to control the water quality of releases.

The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

8.3 WATER QUALITY AND CHEMISTRY (40 CFR 230.22)

The characteristics of water quality include clarity; nutrient, metal, and chemical content; physical and biological content; dissolved gas levels; pH; and temperature. The study area lies within the larger Poudre and South Platte River watersheds. The Colorado Water Quality Control Division monitors surface water quality at multiple stations within Segments 10, 11, and 12 of the Poudre River and Segment 1b of the South Platte River. According to Colorado's Section 303(d) list of impaired waters (CDPHE, CCR 1002-93), aquatic life uses are not fully supported in Poudre River Segment 10 due to nonattainment of water quality standards for copper and temperature. Poudre River Segments 11 and 12, and South Platte River Segment 1b are not in attainment because of selenium levels. Sections 3.5 of the DEIS and 3.3 of the SDEIS, "Surface Water Quality", describe the existing water quality characteristics of the study area.

8.3.1 Potential Impacts

Project-related impacts on water quality and chemistry may occur during the entire life of the Project, including construction and operations. Impacts may result from land disturbance activities, groundwater flow changes, channel modification, and changes in water chemistry due to Project diversions and operations. Project-related impacts on water quality could result from watershed alterations, additional loading of nutrients or contaminants, water withdrawals and discharges, stormwater runoff, alteration of groundwater contributions, interaction with pit lakes and backfilled areas, and clearing and industrial activity. These impacts are discussed in Sections 4.5 of the DEIS and 4.3 of the SDEIS. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

8.4 WATER CIRCULATION AND CURRENT PATTERNS (40 CFR 230.23)

Freshwater circulation in the study area is influenced by river drainages, smaller streams, and groundwater inflows. The study area is in the Poudre and South Platte River watersheds. Streams within the study area include Owl Creek, Black Hollow Creek, several unnamed tributaries to the Poudre River, and the South Platte River.

The Cache la Poudre River drains east from its headwaters in Rocky Mountain National Park, at an elevation of nearly 10,755 feet, joining the South Platte River near Greeley at an elevation of approximately 4593 feet. The Poudre River drains about 1890 square miles of the Colorado Front Range and adjacent plains and is one of the main mountain tributaries of the South Platte River.

Upper Poudre Basin snowmelt is the single largest component of the overall Poudre Basin water supply and runs off primarily during May through July each year. Total annual volumes vary considerably from year-to-year. In general, annual runoff peaks appear to follow cyclic patterns,

with repeated periods of increasing and decreasing flows. Additional water supply is delivered to the Poudre Basin by a series of transbasin imports. These imports originate in the Colorado, Laramie, or North Platte River Basins and are delivered to the headwaters of the Poudre River upstream of the Canyon Gage by ditches or tunnels. Numerous diversions occur on the Poudre River throughout the study area for municipal and industrial (M&I) use and irrigation.

On the South Platte River, total annual flow volumes vary considerably from year to year. Because of limited precipitation and runoff in the lower South Platte River Basin, surface water users are highly dependent on return flows from upstream use of native river water and Colorado-Big Thompson (C-BT) water. Numerous diversions on the South Platte provide irrigation water and are used to deliver storage water to several large reservoirs on the lower South Platte River.

Sections 3.3 of the DEIS and 3.2 of the SDEIS, "Surface Water" describe the existing freshwater circulation characteristics of the study area.

8.4.1 Potential Impacts

Project-related impacts on surface water hydrology, including freshwater circulation and current patterns, may occur during the entire life cycle of the Project, including construction and operations. Impacts may be caused by land disturbance activities, groundwater flow changes, channel modifications, and Project diversions and operations.

Project-related impacts on freshwater circulation and current patterns could result from watershed alterations, water withdrawals and discharges, stormwater runoff, alteration of groundwater contributions, and clearing and industrial activity. These impacts are discussed in the following sections of the DEIS and SDEIS:

DEIS

- 4.3 Surface Water
- 4.4 Stream Morphology
- 4.7 Ground Water

SDEIS

- 4.2 Surface Water
- 4.4 Stream Morphology and Sediment Transport
- 4.5 Ground Water

The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

8.5 ALTERATION OF NORMAL FLUCTUATIONS (40 CFR 230.24)

Natural water fluctuations in an aquatic ecosystem consist of daily, seasonal, and annual flood fluctuations in water level. Sections 3.3 of the DEIS and 3.2 of the SDEIS, "Surface Water" and Section 3.4, "Stream Morphology" of the DEIS and Section 3.4, "Stream Morphology and Sediment Transport" and Section 3.9, "Wetlands, Riparian Resources and Other Waters" of the SDEIS describe the existing freshwater fluctuations in the study area.

In the upstream reaches of the Poudre River within the study area, from the canyon through Fort Collins to the vicinity of Interstate 25 (I-25), bankfull discharge varies from around 1,000 cfs to over 20,000 cfs in these reaches. The channel characteristics are less variable downstream of I-25 than upstream. Channel size and capacity reduce progressively in a downstream direction except for the Greeley Channelized Reach characterized by high hydraulic depth and high bankfull discharge. Ongoing channel contraction and related vegetation encroachment will continue to increase flood risk under baseline conditions for the mainstem downstream of I-25. This has been recognized by the Corps (Ottertail 2010) in their investigation of flooding in the vicinity of Greeley.

8.5.1 Potential Impacts

The analysis of impacts related to normal water fluctuations will include consideration of changes to the daily, seasonal, and annual water-level fluctuation pattern of an area and the effects of prolonged periods of inundation; exaggerated extremes of high and low water; or static, non-fluctuating water levels. Water level modifications may alter erosion or sedimentation rates, aggravate water temperature extremes, and alter the nutrient and DO balance of the aquatic ecosystem. In addition, water level modifications may alter aquatic and wetland habitats.

All alternatives are predicted to reduce inundation along the mainstem. Reductions in inundation are predicted to affect the plains cottonwood woodlands which appear to be on a trajectory that would eventually lead to their decline. Nonnative woody vegetation (e.g., green ash, Russian olive, and Siberian elm) are predicted to increase. In the future, plains cottonwoods would likely not dominate the riparian woodlands along the mainstem. The 2013 Stream Morphology Baseline Report concluded that the ongoing trend associated with channel contraction downstream of I-25 would likely lead to an increase in overbank flooding. The 2014 Stream Morphology Effects Report suggests that the predicted effect of the trend of channel contraction on flooding is balanced to some extent by the decreased frequency of flooding at each recurrence interval associated with project diversions. However, larger flood events (such as the 100-year flood) would be less affected by this decrease in flood frequency. Additionally, while project alternatives could provide positive benefits in the reduction of flooding, there is no certainty that the diversions would occur during a flooding event. Although channel contraction is predicted to lead to floodplain engagement at lower flows, which could have ecological benefits, the frequency of flows around the current two-year to five-year flood would also be reduced.

Sections 4.3 of the DEIS and 4.2 of the SDEIS, "Surface Water" and Section 4.4, "Stream Morphology" of the DEIS and Section 4.4, "Stream Morphology and Sediment Transport" and Section 4.9, "Wetlands, Riparian Resources and Other Waters" of the SDEIS describe the potential impacts of Project operations on water fluctuations. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

8.6 SALINITY GRADIENTS (40 CFR 230.25)

Salinity gradients form where saltwater from the ocean meets and mixes with freshwater from land. There are no marine or estuarine environments in the Project area; therefore, there would be no impact to salinity gradients within the study area.

9. SUBPART D: POTENTIAL IMPACTS ON THE BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM

9.1 THREATENED AND ENDANGERED SPECIES (40 CFR 230.30)

Federally listed species include those species listed as threatened, endangered, or candidate by the U.S. Fish and Wildlife Service (USFWS) under the ESA. *Endangered species* include any species that is in danger of extinction throughout all or a significant portion of its range. *Threatened species* indicate any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. *Candidate species* are plant and animal taxa considered for possible addition to the List of Endangered and Threatened Species. For these taxa, the USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions.

Threatened and endangered species that may be affected by the proposed Project are described in Sections 3.16 and 3.27.8, "Species of Concern" of the DEIS and 3.11, "Special Status Species" of the SDEIS. Threatened and endangered species potentially occurring within the reservoir and conveyance system study areas include the following:

- Black-footed ferret (*Mustela nigripes*) – federally listed as endangered
- Preble's meadow jumping mouse (*Zapus hudsonius preblei*) – federally listed as threatened
- Colorado butterfly plant (*Gaura neomexicana coloradensis*) – federally listed as threatened
- Ute ladies'-tresses orchid (*Spiranthes diluvialis*) – federally listed as threatened

In addition to the above "local" threatened and endangered species that may be affected, flow depletions to the Poudre and South Platte Rivers have the potential to affect the following federally listed species and their designated critical habitat dependent on the Platte River System in Nebraska:

- Whooping crane (*Grus americana*) Endangered
- Least tern (*Sterna antillarum*) Endangered
- Eskimo curlew (*Numenius borealis*) Endangered
- Piping plover (*Charadrius melodus*) Threatened
- Pallid sturgeon (*Scaphirhynchus albus*) Endangered
- Western prairie fringed orchid (*Platanthera praeclara*) Threatened

9.1.1 Potential Impacts

Sections 4.16 and 4.29.8, "Species of Concern" of the DEIS and 4.11, "Special Status Species" of the SDEIS discuss potential impacts to Federal and State listed threatened, endangered, and candidate species and Colorado Natural Heritage Program (CNHP) listed species in the Project area. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

9.2 AQUATIC FOOD WEB (40 CFR 230.31)

The aquatic food web includes the current physical environment (streamflow, stream bottom composition, stream width, and riparian vegetation) and the associated biological assemblages or communities (the species composition) of various waterbodies within the resource study area. Biological assemblages consist of:

- Fish
- Benthic macroinvertebrates – animals without backbones larger than 0.5 millimeter that live on the bottom of a waterbody
- Freshwater mussels
- Amphibians and reptiles
- Aquatic vegetation
- Aquatic periphyton – algae, cyanobacteria, microbes, or detritus attached to submerged surfaces that serve as food sources to aquatic animals

Additional discussion of these assemblages can be found in Section 3.15, "Fish and Other Aquatic Life" of the DEIS and 3.12, "Aquatic Biological Resources" of the SDEIS.

9.2.1 Potential Impacts

Potential Project-related impacts on aquatic resources include direct and indirect impacts caused by filling of portions of streams, and depressional and riverine wetlands; diversion of the Poudre and South Platte Rivers; alteration of the existing flow regimes; alteration of the stream morphology or structure; creation of new reservoirs with new aquatic habitats; and changes to water quality.

In areas where streams would be filled, direct habitat loss for aquatic species may occur, in addition to alterations in downstream flow and associated stream morphological features. The proposed diversion of the Poudre and South Platte Rivers would affect the flow regime.

Construction of Glade Reservoir would permanently fill and alter portions of Owl Creek. Construction at all three reservoirs would permanently fill unnamed tributaries and wetlands and create new aquatic habitats that would contribute to the aquatic food web. The NISP also would result in flow regime changes on the Poudre and South Platte Rivers due to Project operations. Section 4.15, "Fish and Other Aquatic Life" of the DEIS and 4.12, "Aquatic Biological

Resources" of the SDEIS discuss potential impacts on aquatic ecosystems and organisms in the study area. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

9.3 OTHER WILDLIFE (40 CFR 230.32)

Wildlife associated with aquatic ecosystems includes resident and transient mammals and birds. The majority of the NISP study area comprises grasslands, shrublands, and agricultural lands. Woodlands are present in the Glade and No Action Alternative study areas. Riparian vegetation types along the Poudre and South Platte Rivers include woodlands and shrublands. Riparian wildlife habitat is described in Sections 3.13 and 3.27.6 of the DEIS and 3.9 of the SDEIS. Sections 3.14 and 3.27.7 of the DEIS and 3.10 of the SDEIS, "Wildlife" describe wildlife potentially occurring in the study area. Table D-6 below presents common wildlife species that may occur in the Project alternatives reservoir and conveyance systems study areas.

Table D-6. Common wildlife species potentially occurring in the reservoir and conveyance system study areas.

Habitat	Mammals	Birds	Reptiles and Amphibians
All habitats (except water)	Mule deer, eastern cottontail rabbit, fox squirrel, striped skunk, raccoon, red fox, coyote, plains pocket gopher deer mouse	American robin, black-capped chickadee, spotted towhee, northern flicker, house finch, house sparrow, western meadowlark, Canada goose, red-tailed hawk. mourning dove, American crow, great horned owl	Plains, western terrestrial, and common gartersnakes; eastern fence lizard, short-horned lizard, bullsnake, western hognose snake, plains milk snake, western rattlesnake
Grassland (includes native prairie, pastures, agricultural fields, and open space)	White-tailed deer, pronghorn, raccoon, skunk, coyote, red fox, swift fox, badger, black-tailed jackrabbit; desert, eastern, and mountain cottontail rabbit, cottontail rabbit, Ord's kangaroo rat, black-tailed prairie dog, thirteen-lined ground squirrel, spotted ground squirrel, plains pocket gopher; olive-backed, plains, and hispid pocket mouse; deer mouse, prairie vole	Raptors, spotted towhee, scrub jay, dusky flycatcher, green-tailed towhee, western meadowlark, lark sparrow, vesper sparrow, killdeer, horned lark, mourning dove, eastern kingbird, black-billed magpie, waterfowl	Plains spadefoot, Great Plains toad, Woodhouse's toad, box turtle, many-lined skink, six-lined racerunner, lesser earless lizard, eastern yellow-bellied racer, plains black-headed snake
Grasslands with prairie dog colonies	Black-tailed prairie dog, badger, coyote, grasshopper mouse	Raptors, burrowing owl, horned lark, mountain plover	Rattlesnake
Riparian and wetland	White-tailed deer, raccoon, meadow vole, western harvest mouse, striped skunk, white-footed mouse, hoary bat, little brown myotis, silver-haired bat	Raptors, red-winged blackbird, yellow-headed blackbird, song sparrow, common snipe, great blue heron, house wren, Bullock's oriole, northern flicker, tree swallow, yellow warbler, blue grosbeak, Lazuli bunting, common yellowthroat, American goldfinch, black-capped chickadee, black-headed grosbeak, western wood Pewee, Lewis's woodpecker, downy woodpecker	Plains spadefoot, northern leopard frog, Woodhouse's toad, tiger salamander, bullfrog, western chorus frog; painted, soft-shelled, ornate, and snapping turtle; northern water snake, bull snake, eastern yellow-bellied racer, prairie rattlesnake
Open water: lakes, ponds, rivers (Poudre and South Platte River corridors)	American beaver, muskrat	Raptors, red-winged blackbird, yellow-headed blackbird, song sparrow, common snipe, American coot, American widgeon, blue-winged teal, mallard, spotted sandpiper, American avocet, wood duck, Canada goose, loon, grebe, cormorant, heron, ibis, rail, crane, gull, tern	Common gartersnake, northern leopard frog, Woodhouse's toad, tiger salamander, bullfrog, western chorus frog; painted, soft-shelled, ornate, and snapping turtle; northern water snake
Foothills habitats (xeric shrub and grassland) and rocky habitat	Elk, mountain lion, black bear, bushy tailed wood rat, Mexican wood rat, rock squirrel, rock mouse, little brown myotis, big brown bat	Raptors, cliff swallow	Rattlesnake, black-headed snake, plateau lizard

Source: Fitzgerald et al. 1994, COBBAII 2014, Hammerson 1999.

9.3.1 Potential Impacts

Key issues of concern for terrestrial wildlife include (1) the potential for habitat loss and habitat fragmentation (the division of large, contiguous blocks of habitat into smaller, more isolated parcels that are less suitable for wildlife) associated with removal of vegetation, construction of reservoirs and associated facilities, and road realignments; and (2) potential mortality of wildlife during initial clearing and along access roads and permanent road realignments. Habitat loss and fragmentation may extend beyond the areas directly disturbed within the Project boundary to include some additional area in the vicinity of the Project boundary where noise and other human activity could decrease the suitability of the area.

Impacts on wildlife are discussed in Sections 4.14 and 4.29.7 of the DEIS and Section 4.10 of the SDEIS, "Wildlife". The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

10. SUBPART E: POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES

Special aquatic sites are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region (see 40 CFR 230.10[a][3]).

10.1 SANCTUARIES AND REFUGES (40 CFR 230.40)

Sanctuaries and refuges consist of areas designated under state or federal laws or local ordinances to be managed principally for the preservation and use of fish and wildlife resources. There are several Natural Areas managed by the City of Fort Collins along the Poudre River within the Project area. The Fort Collins Natural Areas Program has documented 230 species of birds, 32 species of mammals, 5 species of amphibians, and 8 species of reptiles within the Poudre River corridor from Highway 14 to I-25 (Fort Collins Natural Areas Program 2011). Additionally, there are three state wildlife areas (SWAs) designated along the Poudre River: Watson Lake, Frank, Kodak Watchable; and two on the South Platte River: Mitani-Tokuyasu, and Centennial Valley. There are no designated Federal sanctuaries or refuges within the Project area.

10.1.1 Potential Impacts

The analysis of impacts related to sanctuaries and refuges in the study area includes consideration of disruption of the breeding, spawning, migratory movements, or other critical life requirements of resident or transient fish and wildlife; creation of easy and incompatible human access to remote aquatic areas; creation of the need for frequent maintenance activity; establishment of undesirable competitive species of plants and animals; changes in the balance of water and land areas needed to provide cover, food, and other fish and wildlife habitat requirements in a way that modifies sanctuary or refuge management practices; and any other adverse impacts discussed in Subparts C, D, or F as they relate to a particular sanctuary or refuge. Sections 4.14, "Wildlife," 4.15, "Fish and Other Aquatic Life," and 4.17, "Recreation" of the DEIS and Sections 4.9, "Wetlands, Riparian Resources, and Other Waters," 4.10, "Wildlife," 4.12, "Aquatic Biological Resources," and 4.16, "Recreation" of the SDEIS describe the potential effects of the proposed Project on sanctuaries and refuges in the study area. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

10.2 WETLANDS (40 CFR 230.41)

Wetlands are defined as:

…Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions…(33 CFR 328.3[b]).

Sections 3.12 and 3.27.5, "Wetlands and Other Waters" of the DEIS and Section 3.9, "Wetlands, Riparian Resources, and Other Waters" of the SDEIS describe wetlands present in the study area.

The proposed Project is located within the Poudre and South Platte River watersheds. Several tributaries, canals, and ditches discharge to and are filled with water diverted from these rivers. Depressional and riverine wetlands are found along these drainages.

Many of these wetlands and streams in the study area are often small with minimal flow, yet critical to the health of the entire river network and downstream communities. Wetlands trap floodwaters; filter pollutants and recycle potentially harmful nutrients; provide fish and wildlife habitat; and sustain the health of downstream rivers. These streams also play a critical role in maintaining the quality and supply of drinking water, ensure a continual flow of water to surface waters, and help recharge underground aquifers. Potentially jurisdictional wetlands and waters of the U.S. within the Project boundary are quantified in Table D-7.

Table D-7. Potentially jurisdictional wetlands and waters of the U.S. within the proposed reservoirs Project areas.

Wetlands and Other Waters (acres)	Alternative 2: Glade Reservoir (including U.S. 287 Realignment)	Alternatives 2, 3, and 4: Galeton Reservoir	Alternatives 1, 3, and 4: Cactus Hill Reservoir (120,000 and 190,000 AF)
Palustrine Emergent and Scrub-shrub Wetlands	76	1	42
Stock and Irrigation Ponds	11	0	5
Creeks, Streams, Ditches, and Canals	25	1	3
Total	**116**	**2**	**50**

10.2.1 Potential Impacts

The proposed Project involves both direct and indirect impacts to waters of the U.S. Direct impacts from excavation and fill activities for construction of reservoirs and associated infrastructure would result in a permanent loss of wetlands and streams. The proposed Project also involves diversions on the Poudre and South Platte Rivers with the potential to adversely affect hydrology, water quality, and thermal regimes in surface water and groundwater resources, resulting in indirect impacts on waters of the U.S. Lining of the Poudre Valley Canal would cause indirect impacts on downgradient wetlands and streams and the aquatic resources using those habitats. Furthermore, indirect impacts could occur in the upstream and downstream

portions of the stream corridors as a result of habitat fragmentation from the direct Project footprint.

Sections 4.12 and 4.29.5, "Wetlands and Other Waters" of the DEIS and Section 4.12, "Wetlands, Riparian Resources, and Other Waters" of the SDEIS discuss the potential impacts on wetlands. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

10.3 MUDFLATS (40 CFR 230.42)

Mudflats are broad, flat areas along the sea coast and in coastal rivers to the head of tidal influence and in inland lakes, ponds, and riverine systems. There are no mudflats in the Project area or study area.

10.4 VEGETATED SHALLOWS (40 CFR 230.43)

Vegetated shallows are permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as turtle grass and eelgrass in estuarine or marine systems, as well as a number of freshwater species in rivers and lakes.

Sections 3.12 and 3.27.5, "Wetlands and Other Waters" and Section 3.15, "Fish and Other Aquatic Life" of the DEIS and Sections 3.9, "Wetlands, Riparian Resources, and Other Waters" and 3.12, "Aquatic Biological Resources" of the SDEIS describe vegetated shallows present in the study area.

The only available algae data were collected from four sites in the Poudre River mainstem in the 1990s as part of the National Water-Quality Assessment (NAWQA) Program. The limited available data indicate that periphytic algae (periphyton) in the mainstem comprise numerous species. The periphyton communities at each site were generally dominated by diatoms or blue-green algae, which is typical for rivers such as the mainstem. There was a trend for higher density of periphyton in a downstream direction along the river, suggesting enrichment by nutrients. The high diversity of the community and low proportion of species that are tolerant of disturbance indicates that there has not been unusual disruption of the bottom substrate of the river, such as from high flows and that the periphyton community is not stressed. No periphyton data are available for the portion of the South Platte River within the Project area. The sandy substrate in the river is not very suitable for sustaining algae. Larger hard surfaces, such as large gravel, cobble, and boulders would provide more suitable substrate but are limited. This portion of the river likely supports many different species of periphyton in low densities limited by the available substrate.

Freshwater vegetated shallows in the study area include palustrine emergent wetland vegetation such as cattails (*Typha* sp.), sedges (*Carex* spp.), and rushes (*Juncus* spp.). Within the Poudre

River riparian corridor in the Project area, herbaceous vegetation in permanent standing water covered approximately 262 acres.

10.4.1 Potential Impacts

Direct impacts from excavation and fill activities for construction of reservoirs and associated facilities would result in a permanent loss of wetlands and streams, with associated loss of vegetated shallows in these areas. The proposed Project also involves modification to existing canals, resulting in indirect impacts on vegetated shallows. Furthermore, indirect impacts could occur in the vegetated shallows upstream and downstream of the stream corridors as a result of habitat fragmentation from the direct Project footprint.

Sections 4.12 and 4.29.5, "Wetlands and Other Waters" and Section 4.15, "Fish and Other Aquatic Life" of the DEIS and Sections 4.9, "Wetlands, Riparian Resources, and Other Waters" and 4.12, "Aquatic Biological Resources" of the SDEIS discuss the potential impacts on aquatic vegetation under all SDEIS alternatives. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

10.5 CORAL REEFS (40 CFR 230.44)

Coral reefs consist of the skeletal deposit of invertebrate organisms present in growing portions of a reef. There are no coral reefs in the study area.

10.6 RIFFLE AND POOL COMPLEXES (40 CFR 230.45)

Riffle and pool complexes exist along steep gradient sections of streams where the rapid movement of water over a course substrate in riffles results in rough flow, a turbulent surface, and high DO levels.

Riffles are intermixed with pools, which are characterized by slower stream velocity, smooth surface, and a finer substrate. Riffle and pool complexes are particularly valuable habitat for fish and wildlife. Areas in streams within the study area have sufficient grade, flow, and cobble and gravel substrate to produce riffle and pool complexes. Sections 3.3, "Surface Water" and 3.4, "Stream Morphology" of the DEIS and Sections 3.2, "Surface Water" and 3.4, "Stream Morphology and Sediment Transport" of the SDEIS describe the characteristics of the streams and existing riffle and pool complexes in the study area.

10.6.1 Potential Impacts

Rifle and pool complexes in the study area may be indirectly affected by Project activities. The proposed Project involves changes to flow regimes from Project operations, with the potential to adversely affect hydrology, sediment transport, water quality, and thermal regimes in riffle and pool complexes, resulting in indirect impacts to these special aquatic sites.

The complexity of in-channel morphologic features is already low on the mainstem in the reaches downstream of I-25 as the result of sand deposition smothering the bed and reducing the magnitude and frequency of pool and riffle sequences. Further channel contraction under all of the alternatives is predicted to exacerbate this condition.

Sections 4.3, "Surface Water" and 4.4, "Stream Morphology" of the DEIS and Sections 4.2, "Surface Water" and 4.4, "Stream Morphology and Sediment Transport" of the SDEIS discuss the potential impacts on streams and riffle and pool complexes. The impact analyses in the DEIS, SDEIS, and FEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

11. SUBPART F: POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS

11.1 MUNICIPAL AND PRIVATE WATER SUPPLIES (40 CFR 230.50)

Surface water and groundwater resources may be used for agricultural, domestic, industrial and commercial, and public water supply uses downstream of and adjacent to the Project area. There are numerous permitted surface water and ground water withdrawals within the study area. There are about 54 groundwater wells in the study areas that have been constructed and may still be operational.

Section 3.3, "Surface Water" of the DEIS describes municipal and private water supplies in the study area. Other portions of the DEIS describe closely related resources (Sections 3.5, "Surface Water Quality; 3.6, "Water Rights and 3.7 "Ground Water" and physical and biological assemblages of surface waters in the study area (Sections 3.12, "Wetlands and Other Waters" and 3.15, "Fish and Other Aquatic Life"). Updated information is presented in the following SDEIS sections: 3.2, "Surface Water," 3.3, "Surface Water Quality," 3.5, "Ground Water," 3.9, "Wetlands, Riparian Resources and Other Waters," and 3.12, "Aquatic Biological Resources."

11.1.1 Potential Impacts

Proposed Project operations include diversions on the Poudre and South Platte River for M&I use. The proposed withdrawal of surface water, alterations in the watershed that may affect runoff rates and volumes, changes to ground water flows, and releases from regulated stormwater discharges may affect water supplies in the study area.

Potential direct and indirect impacts on water supplies associated with the Project include the following:

- Changes in alluvial ground water levels
- Changes in surface water flow could affect the availability of water for downstream surface water users

Under all of the alternatives, no adverse impact to water quality in the Poudre River is anticipated that would affect treatment requirements at the City of Greeley's Bellvue WTP. Under Alternative 2 with the Reclamation Action Option, small changes in Horsetooth Reservoir water quality at the Soldier Canyon outflow are predicted. TOC concentrations are estimated to be slightly higher, but not to a level that would require increasing the level of treatment at the Fort Collins or Tri-District's WTP. Section 4.5, "Water Supply and Floodplains" of the DEIS and Section 4.2, "Surface Water" address the Project-related impacts on water supply that are associated with these concerns. Other Project-related changes that may occur to surface water

and groundwater resources are described in Sections 4.3, "Groundwater Hydrology and Water Quality," 4.4, "Surface Water Hydrology and Water Quality," 4.6, "Wetlands and Other Waters of the United States," and 4.7, "Aquatic Resources" of the DEIS. The impact analyses in the SDEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

11.2 RECREATIONAL FISHING (40 CFR 230.51) AND WATER-RELATED RECREATION (40 CFR 230.52)

Downstream of the Poudre Valley Canal diversion, the Poudre River currently receives limited use by kayakers and canoers. However, local boaters occasionally paddle the lower Poudre River through Fort Collins in kayaks or canoes. This reach of the river is also popular for tubing. The suggested minimum flow for recreation in this reach of the Poudre River through Fort Collins, including the proposed whitewater park, is 150 cfs. This is believed to be the minimum necessary to support a range of common river-based recreational experiences, including tubing, canoeing, and potential future whitewater park use. Fishing on the mainstem has become increasingly popular over the years. Use appears to have been increasing each year on the Poudre River from Watson Lake to Lee Martinez Park, and this reach of the Poudre River is within the top third of areas used by anglers in the South Platte River Basin. Fishing on the Poudre River through Fort Collins has the highest use in summer and fall with slightly less use in the spring and winter. Wild spawn, coldwater species favored by sport anglers such as brown and rainbow trout occur in this section. Most of the ponds on public lands along the mainstem are stocked with warmwater species, and receive an estimated 1,000 to 1,500 hours/acre of fishing use annually. The South Platte River from Greeley to Fort Morgan is managed for native warmwater species habitat rather than recreational fishing, and is not stocked. This section of the South Platte River is not frequently used for recreational boating.

Section 3.17, "Recreation" of the DEIS and Section 3.16, "Recreation" of the SDEIS describes water-related recreation resources in the study area.

11.2.1 Potential Impacts

Potential issues that could affect water-related recreational experiences include changes to the recreational setting and experience caused by Project-related noise or visual changes; impaired access to recreational areas; degraded recreational wildlife viewing, fishing, hunting, and boating opportunities; reductions in flows, changes in water quality conflicts with adopted recreation plans or policies, and the creation of reservoirs that could provide new recreational opportunities.

Section 4.17, "Recreation Resources" of the DEIS and Section 4.16, "Recreation Resources" of the SDEIS describes the potential effects of the proposed Project on recreation resources within the study area. The impact analyses in the SDEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

11.3 AESTHETICS (40 CFR 230.53)

Aesthetics associated with the environment consist of the perception of visual resources, including the natural and manmade features of an area such as landforms, vegetation, water surfaces, and cultural modifications that give a particular landscape its character and aesthetic quality. The study area for visual resources and aesthetics is defined as the area within the Project boundary, adjacent parcels, and viewing areas from where Project-related features and construction, operation, and maintenance activities have the potential to be visible.

Section 3.18, "Visual Resources" of the SDEIS describes the visual resources in the study area. The visual character of the study area is primarily rural, with some urban development along the Poudre River corridor. The topography within and adjacent to the Project site varies from low mountains to high plains.

The landscape character comprises 2 general types of landforms: Foothills, which includes low mountains, geological hogback formations, and valleys and contains large rock outcrops and boulders; and High Plains, which consists of low-lying, long, gentle hills and contains creeks and the Poudre River corridor and prairie landscapes.

11.3.1 Potential Impacts

Construction activities and project operations have the potential to affect the visual character of the study area in the short term during construction and in the long term after construction completion and during project operations. Construction activities that would affect the visual character include excavation, stockpiling, and other changes to topography. In addition, Project structures, lighting, and vehicular traffic can affect visual resources. Permanent impacts include the visual impact of the reservoir dams. There would be a change in visual resources from the conversion of land to water surfaces associated with the new reservoirs. The magnitude of impacts on visual resources are influenced by the scale and location of the modifications (e.g., the amount of acreage cleared of vegetation); potential screening or visual obstructions (e.g., vegetation and topography); and proximity of key viewing areas, sensitive features, and public access features (e.g., parks, historic sites, and transportation corridors) to the Project site.

Section 4.18, "Visual Resources" of the SDEIS describes the potential effects of the Project on visual resources and aesthetics. The impact analyses in the SDEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

11.4 PARKS, NATIONAL AND HISTORICAL MONUMENTS, NATIONAL SEASHORES, WILDERNESS AREAS, RESEARCH SITES, AND SIMILAR PRESERVES (40 CFR 230.54)

Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves consist of areas designated under federal or state laws or local ordinances to be managed for their aesthetic, educational, historical, recreational, or scientific value. Section 3.16, "Recreation" of the SDEIS describes parks and preserves in the study area. Cultural resources, such as pre-historic and historic sites, also exist in the Project area. Cultural resources in the Project area are discussed in Section 3.19, "Cultural, Historical, and Paleontological Resources" of the SDEIS.

The Poudre River mainstem study area, which runs from the canyon mouth to the confluence with the South Platte River, largely coincides with the Cache la Poudre River National Heritage Area and is downstream of Wild and Scenic River designated reaches. National Heritage Areas are designated by Congress as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. The National Park Service describes them as "lived-in landscapes." The National Wild and Scenic Rivers System was created by Congress in 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Poudre River upstream of Poudre Park (a few miles above the canyon mouth) is the only Wild and Scenic designated river in Colorado.

Colorado-Big Thompson (C-BT) facilities at Horsetooth Reservoir and Carter Lake would be operational components of Alternative 2, the District's Preferred Alternative. Recreation at Horsetooth and Carter Lake is managed by the Larimer County Parks and Open Lands Department (LCPD). In addition, 25 county- and City of Fort Collins-managed parks and natural areas are within the Project area along the Poudre River and five SWAs are located along the Poudre and South Platte Rivers. These areas provide a variety of recreation facilities and opportunities, including family recreation, picnic areas, hiking trails, fishing, biking, and wildlife viewing.

11.4.1 Potential Impacts

Potential issues that could affect parks and preserves would include changes to the recreational setting and experience caused by Project-related noise or visual changes; impaired access to recreational areas; degraded recreational wildlife viewing, fishing, hunting and boating opportunities; reductions in flows and conflicts with proposed park and preserve plans or policies.

The analysis of impacts on parks, preserves, monuments, and other sites of importance in the SDEIS include consideration of potential modification of the aesthetic, educational, historical, recreational, and/or scientific qualities thereby reducing or eliminating the uses for which such sites are set aside and managed. Historic sites require assessment of the introduction of visual,

audible, or atmospheric elements that are out of character with the historic property or that alter its setting. Sections 4.16, "Recreation" and 4.19, "Cultural, Historical, and Paleontological Resources" of the SDEIS describe the potential effects of the proposed Project on cultural resources, parks, and preserves in the study area. The impact analyses in the SDEIS will be incorporated into this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS.

12. SUBPART G: EVALUATION OF DREDGED OR FILL MATERIAL (40 CFR 230.60)

The purpose of the evaluation procedures and chemical and biological testing sequence outlined in this section is to provide the information needed to support the factual determinations required by "Proposed Disposal Site Determination."

To determine whether additional chemical or biological testing is required, the Corps must consider available information regarding the proposed dredged and fill material, including prior evaluations, chemical and biological tests, scientific research, and past experience. The Guidelines outline the decision-making procedure for this determination, which includes the following determinations:

- If the evaluation under Section B of Subpart G indicates that the dredged and fill material is not a carrier of contaminants, the required determination pertaining to the presence and effects can be made without testing. Dredged or fill material is most likely to be free from chemical, biological, or other pollutants where it is composed primarily of sand, gravel, or other naturally occurring inert material.
- The extraction site shall be examined in order to assess whether it is sufficiently removed from sources of pollution to provide reasonable assurance that the proposed discharge material is not a carrier of contaminants. Factors to be considered include, but are not limited to:
    - Potential routes of contaminants or contaminated sediments to the extraction site, based on maps, aerial photography, or other materials that show watercourses, surface relief, proximity to tidal movement, private and public roads, location of buildings, municipal and industrial areas, and agricultural or forest lands.
    - Pertinent results from tests previously carried out on the material at the extraction site, or carried out on similar material for other permitted projects in the vicinity. Materials shall be considered similar if the sources of contamination, the physical configuration of the sites and the sediment composition of the materials are comparable. Tests from other sites may be relied on only if no changes have occurred at the extraction sites to render the results irrelevant.
    - Any potential for significant introduction of persistent pesticides from land runoff or percolation.
    - Any records of spills or disposal of petroleum products or substances designated as hazardous under Section 311 of the CWA (see 40 CFR 116).
    - Information in federal, state, and local records indicating significant introduction of pollutants from industries, municipalities, or other sources, including the types and amounts of waste materials discharged along the potential routes of contaminants to the extraction site.

  - Any possibility of the presence of substantial natural deposits of minerals or other substances that could be released to the aquatic environment in harmful quantities by human-induced discharge activities.
- Where the discharge site is adjacent to the extraction site and subject to the same sources of contaminants, and the materials at the two sites are substantially similar, the fact that the material to be discharged may be a carrier of contaminants is not likely to result in degradation of the disposal site. In such circumstances, when dissolved material and suspended particulates can be controlled to prevent carrying pollutants to less contaminated areas, testing will not be required.
- Even if the above tests lead to the conclusion that there is a high probability that the material proposed for discharge is a carrier of contaminants, testing may not be necessary if constraints are available to reduce the contamination to acceptable levels within the disposal site and to prevent contaminants from being transported beyond the boundaries of the disposal site. In this case, constraints must be acceptable to the permitting authority, and the potential discharger must be willing and able to implement such constraints. However, even if tests are not performed, the permitting authority must still determine the probable impact of the operation on the receiving aquatic ecosystem. Any decision not to test must be explained in the Factual Determinations.

If, upon evaluation of the proposed dredge or fill material, the Corps determines that additional chemical, biological, and physical testing is required, testing guidelines are outlined under Section 230.61 of the Guidelines. If additional testing is not required, the Corps may use the information outlined above in making the factual determination required in Subpart B "Proposed Disposal Site Determination."

13. SUBPART H: ACTIONS TO MINIMIZE ADVERSE EFFECTS

Minimization includes actions that can be undertaken by the Applicant to minimize the adverse effects of discharges of dredged and fill material. Minimization measures are incorporated into the Corps' evaluation of the proposed Project under the Factual Determinations (Subpart B) and technical evaluation factors (Subparts C through F) as they have the potential to lessen adverse effects on waters of the U.S. and aquatic ecosystems. Minimization measures include, but are not limited to, actions concerning the location of the discharge; actions concerning the material to be discharged; actions controlling the material after discharge; actions affecting the method of dispersion; actions related to technology; actions affecting plant and animal populations; actions affecting human use; and other actions. Examples of each of these action types are discussed below.

The Applicant has identified several potential measures to minimize adverse impacts. These measures are outlined in the Applicant's DA permit application (Northern 2008) and Mitigation Plan, which is Appendix F of the SDEIS (available at: http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado/EISNISP).

The Corps has reviewed the minimization measures proposed by the Applicant and considers them to be a reasonable starting point for developing the full list of all appropriate and practicable steps that can be taken to minimize the potential adverse impacts of the proposed Project. However, the Corps has not yet determined whether the Applicant's proposed minimization actions include all appropriate and practicable measures and has not yet determined whether the Applicant's proposed Project complies with the requirement of minimization of potential adverse impacts. This determination will be included in this document after the public has had an opportunity to comment on the SDEIS and the Corps has published the FEIS. The Corps invites the public to comment on the current list of Applicant-proposed minimization measures and to provide suggestions on additional minimization measures that may be practicable and appropriate to help reduce impacts on waters of the U.S. and aquatic ecosystems.

A general list of minimization measures have been grouped by type and are listed below. The list is not exhaustive, but provides a starting point for consideration of the types of minimization measures that may be available to lessen potential impacts of the proposed Project.

13.1 ACTIONS CONCERNING THE LOCATION OF THE DISCHARGE (40 CFR 230.70)

An extensive alternatives analysis was conducted and is described in Section 2.1 of the DEIS, Section 2.2 of the SDEIS, and Section 2.2 of this document. Following the initial screening and analysis, three action alternatives and a no action alternative underwent a more thorough

environmental analysis. Based on this analysis, the Corps will determine the LEDPA. Once the LEDPA is determined, the District would minimize and avoid, to the extent practicable, the placement of fill and dredged materials into wetlands and other waters.

13.2 ACTIONS CONCERNING THE MATERIAL TO BE DISCHARGED (40 CFR 230.71), ACTIONS CONTROLLING THE MATERIAL AFTER DISCHARGE (40 CFR 230.72), ACTIONS AFFECTING THE METHOD OF DISPERSION (40 CFR 230.73), AND ACTIONS RELATED TO TECHNOLOGY (40 CFR 230.74)

No material that contains hazardous materials would be discharged into waters of the U.S. Best Management Practices (BMPs) would be used to control the material after discharge. Temporary and permanent erosion-control devices would be used during construction of all project facilities to control discharges and methods of discharges into waters of the U.S. Contractors would be required to submit a stormwater management plan to address runoff from the construction sites.

13.3 ACTIONS AFFECTING PLANT AND ANIMAL POPULATIONS (40 CFR 230.75)

BMPs would be followed during all phases of NISP construction. Temporary and permanent erosion control would take place and would include efforts such as sediment control and revegetation. Weed control and weed management would take place during all phases of construction as well.

Preconstruction clearances would be performed to limit impacts to migratory birds in areas of potential habitat for these species, and construction would be timed so that active nests are not affected. Pre-construction surveys would be conducted for plants listed under the ESA in areas of suitable habitat.

The following actions are proposed to avoid and minimize effects to fish populations and other aquatic species:

- SPWCP Diversion would be designed in cooperation with the CPW to avoid fish entrainment.
- NISP diversions under the Grey Mountain storage right would be curtailed to allow for minimum stream flows at the Watson Lake Fish Hatchery.
- Diversions would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River below the Poudre Valley Canal to improve fish habitat.
- Exchanges would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River between the Poudre Valley Canal and the New Cache diversion to improve fish habitat.

- Winter flows (November 1 through April 30 and September 1 through September 30) would be augmented with releases from Glade Reservoir to maintain a flow of at least 10 cfs through Fort Collins to improve fish habitat.
- Water would be released from Glade Reservoir through a multi-level outlet tower to better control temperature and water quality for fish populations.
- Delivery methods from Horsetooth Reservoir to irrigation headgates would be improved to prevent relatively quick changes in flow.

The following actions are proposed to avoid and minimize effects on migratory birds and raptors:

- Vegetation would be cleared during the nonbreeding season
- Active nests would be avoided by having a no-work construction zone

13.4 ACTIONS AFFECTING HUMAN USE (40 CFR 230.76)

The discharge site for construction of reservoirs under any of the action alternatives would be located on intermittent and ephemeral streams to avoid direct impacts to important aquatic areas. There is no on-going recreation at any of the action alternative reservoir sites that would be impacted by reservoir construction. No discharge would occur near any public water supply intake. Traffic control plans would assist in minimizing impacts on drivers during road relocations.

13.5 OTHER ACTIONS (40 CFR 230.77)

The following is a summary of potential mitigation measures proposed by the District, as detailed in Appendix F of the SDEIS, for wetlands, vegetation and other resources:

- Up to 69 acres of wetlands is proposed to be created to mitigate for wetlands and Preble's meadow jumping mouse habitat
- Prairie dogs would be relocated when possible
- CPW-recommended conservation measures would be followed for any sensitive species found during pre-construction surveys
- Bell's twinpod populations would be relocated to the extent possible
- Poudre River stream habitat would be improved through an adaptive management program and from funding by the District
- Two locations on the Poudre River would be improved with measures such as creation of riffles and pools and improved connectivity to the floodplain
- Riparian vegetation along the Poudre River would be increased by planting cottonwoods
- The District would participate in an adaptive management program along the Poudre River
- Big game habitat would be preserved through fee purchase, conservation easements or other land conservation
- Land around Glade Reservoir would be conserved for big game habitat
- Glade Reservoir would serve as a public recreation facility

- Galeton Reservoir could be used as a warmwater fishery
- Crop losses would be mitigated through monitoring of canal water quality and providing additional water sources

14. LITERATURE CITED

BBC Research and Consulting (BBC) and Honey Creek Resources (HCR). 2015. Socioeconomic Resources Affected Environment Technical Report. Prepared for U.S. Army Corps of Engineers. February.

Colorado Breeding Bird Atlas II (COBBAII). 2014. Available at http://bird.atlasing.org/Atlas/CO/. Last accessed February 2015.

Colorado Department of Public Health and Environment (CDPHE). 2014. Regulation 38: Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin. 5 CCR 1002-38. Effective: April 30, 2014.

Economic Research Service. 2007. Agricultural statistics information. Website accessed June 20. Available at: http://www.ers.usda.gov/

ERO Resources Corporation (ERO). 2008a. Wetlands and Other Waters of Technical Report. Prepared for the U.S. Army Corps of Engineers. March.

ERO Resources Corporation (ERO). 2008b. South Platte River near Kersey Stream Morphology Technical Report. Prepared for the U.S. Army Corps of Engineers. March.

ERO Resources Corporation (ERO). 2008c. Cactus Hill Reservoir Salinity Model Technical Report. Prepared for the U.S. Army Corps of Engineers. March.

ERO Resources Corporation (ERO). 2012. Northern Integrated Supply Project, Halligan-Seaman Water Supply Projects Environmental Impact Statement. Common Technical Platform Water Quality Baseline Report. Prepared for the U.S. Army Corps of Engineers.

ERO Resources Corporation (ERO). 2014. Updated Cost Estimate, NISP SDEIS Alternatives. Technical Memorandum from Richard Trenholme to Catherine Blackwell, Corps of Engineers. February.

ERO Resources Corporation (ERO) and HDR Engineering, Inc. (HDR). 2008. Northern Integrated Supply Project Water Quality Technical Report. Prepared for the Army Corps of Engineers. March.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. University Press of Colorado and Denver Museum of Natural History.

Fort Collins Natural Areas Program. 2011. Cache la Poudre River Natural Areas Management Plan Update. Available at: http://www.fcgov.com/naturalareas/pdf/poudre-management-plan2011.pdf. Last updated: June 20, 2011.

GEI Consultants, Inc. (GEI). 2013. Common Technical Platform Aquatic Biological Resources Baseline Report for the Mainstem Cache la Poudre River and South Platte River. Prepared for the U.S. Army Corps of Engineers. February.

Hammerson, G. 1999. Amphibians and Reptiles in Colorado, Second Edition. University Press of Colorado & Colorado Division of Wildlife.

HDR (HDR Engineering, Inc.). 2007. Alternatives Evaluation Report, Volumes I and II. Prepared for the U.S. Army Corps of Engineers Omaha District.

Johnson, B., M. Beardsley, and J. Doran. 2010. The Functional Assessment of Colorado Wetlands (FACWet) Method – Version 2.0 Review Draft. Prepared for the Colorado Department of Transportation. September.

MWH. 2004. NISP Phase II Alternative Evaluation. Final Report. Prepared for the Northern Colorado Water Conservancy District. January.

Northern Colorado Water Conservancy District (District). 2008. DA permit application submitted to the U.S. Army Corps of Engineers.

NRCS. 1980. Soil Survey of Larimer County Area, Colorado. Available at http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/colorado/larimerCO1980/Larimer.pdf

NRCS. 1982. Soil Survey of Weld County, Northern Part, Colorado. Available at http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/colorado/CO617/0/weld.pdf

Ottertail Environmental Inc. (Ottertail). 2010. Potential Restoration Benefits for the Cache la Poudre River General Investigation Study Flood Control/Environmental Restoration Project. W912F-08-T-0129. Prepared for the U.S. Army Corps of Engineers. March.

U.S. Army Corps of Engineers (Corps). 2008. Northern Integrated Supply Project Draft Environmental Impact Statement. Available at: http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Colorado/EISNISP.aspx

Western Regional Climate Center (WRCC). 2014. Climate Data. "Colorado Climate Summaries." Accessed at: http://www.wrcc.dri.edu/summary/climsmco.html.

APPENDIX E

CACHE LA POUDRE RIVER STREAM MORPHOLOGY REACHES

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Appendix E
Cache la Poudre River
Stream Morphology Reaches

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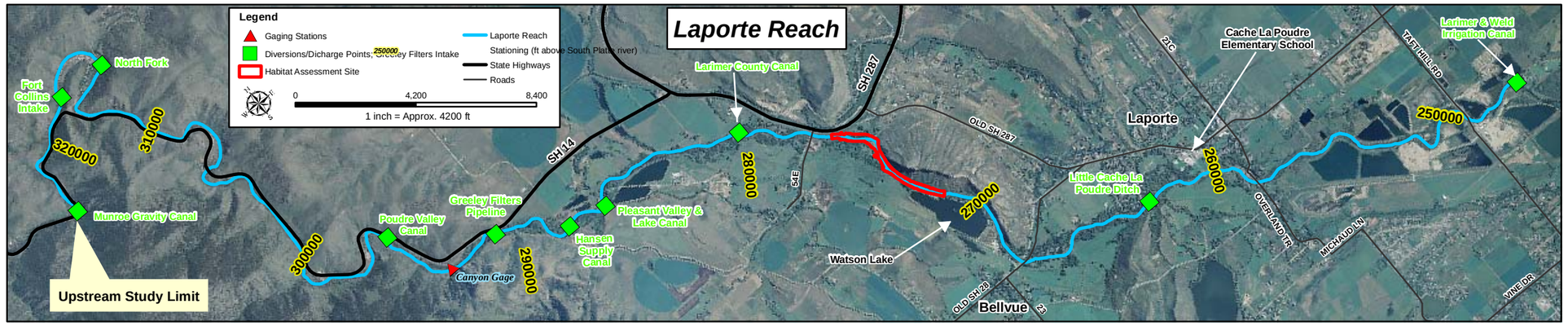
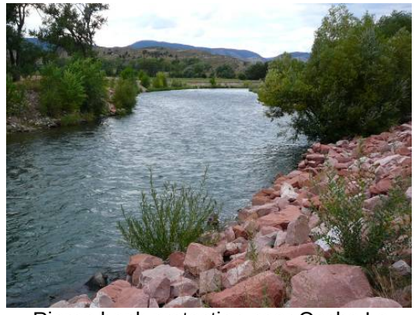
Figure 3.13(a) Laporte Reach – from Munroe Canal (323,059 ft) to Larimer and Weld Canal (246,435 ft).



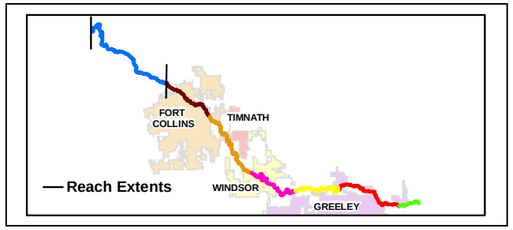
Canyon Gage at mouth of canyon

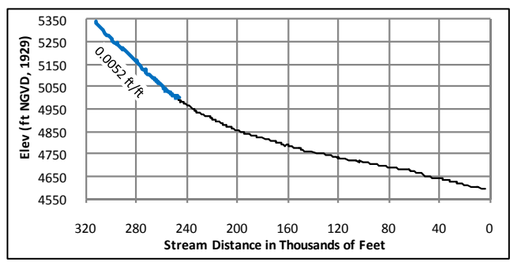
Mid-channel island downstream of bridge at Bellvue



Riprap bank protection near Cache La Poudre Elementary school in Laporte

Gravel mining zone upstream of Taft Hill





Average planform characteristics		
Sinuosity	1.11	
Meander wavelength	1900	ft
Meander amplitude	380	ft
Average bankfull characteristics*		
Discharge	8240	cfs
Top width	170	ft
Hydraulic depth	6.2	ft
Average bed material characteristics		
D_{50} surface material	95 (SC)	mm
D_{50} sub-surface material	13 (MG)	mm

*Note: bankfull characteristics are highly variable in this reach

This is a steep reach of river characterized by a wide cobble bed channel and low sinuosity. The upstream limit of the reach is within the Poudre River Canyon with the mouth of the canyon marked by the **Canyon Gage**. On entering the plains, the river maintains its steep slope past **Watson Lake** at Bellvue, with a relatively straight alignment through **Laporte** and the extensive gravel workings immediately downstream.

Several significant diversions occur in this reach including the **Munroe Canal, Poudre Valley Canal, Greeley Filters Intake, Larimer County Canal and the Little Cache la Poudre Canal**, but unlike some of the diversions further downstream, there is no immediately apparent effect of the water diversions on channel morphology apart from sediment accumulation in the weir pools.

At bridge sites and in the vicinity of Laporte, there is evidence of intermittent works to control bank erosion using rock riprap or by shifting of gravel and cobbles from the river bed.

For description, the reach can be further subdivided into an upper, middle and lower sub-reach.

- **Upper**. The upper sub-reach extending down to about the **Canyon Gage**, has a gorge-like character, confined by its valley, sharing the narrow canyon floor with **State Hwy 14**.
- **Middle**. The middle sub-reach extends from the **Canyon Gage** through Laporte to the start of gravel mining operations, downstream of **Overland Trail**. This sub-reach encompasses the transition from the canyon (described above) to an unconfined alluvial river. The channel has a strong pool-riffle sequence with evidence of zones of sediment accumulation in the bed, leading at times to alignment instability and bank erosion (for example, behind the **elementary school in Laporte**). In some locations, accumulated bed material has been moved from the bed of the river and rock riprap bank protection has been placed. Where sediment accumulations have formed mid-channel bars and been colonized by vegetation, they have formed islands within the channel (e.g., downstream of **Overland Trail**– see inset photo).

There are zones of riparian vegetation through this sub-reach but the riparian corridor is discontinuous.

- **Lower**. The lower sub-reach is similar to the above but characterized by the presence of gravel mining ponds across the floodplain and the associated lack of a riparian corridor. The sub-reach ends at the **Larimer and Weld Irrigation Canal** diversion which marks a decrease in channel width.

River Processes. The dominant river process in this reach appears to be the deposition of material in the bed of the channel in the middle and lower sub-reaches. The deposition likely occurs during flood events when water funnelled down the canyon reach starts to spread out of the channel onto the adjacent flats. Material mobilized in the canyon, can no longer be transported by the reduced in-channel flow and the material is deposited in the channel to form mid-channel bars, alternating bars or side bars attached to adjacent banks. This is a typical canyon mouth process. Downstream of Overland Trail and through the gravel mining sub-reach, vegetation is establishing on the mid-channel bars and some are becoming permanent islands.

Deposition in the channel is generally associated with some instability of channel alignment, manifesting as bank erosion as the river moves to accommodate the blockage.

Processes in this reach are flood dominated. During future flood events, some of the existing bars could be stripped of vegetation and remobilized, but a trend of sediment deposition is expected to continue. Without management intervention to stabilize banks or remove bars, it is likely that from time to time, deposition will cause the channel to block and the river will cut a new course around the blockage.

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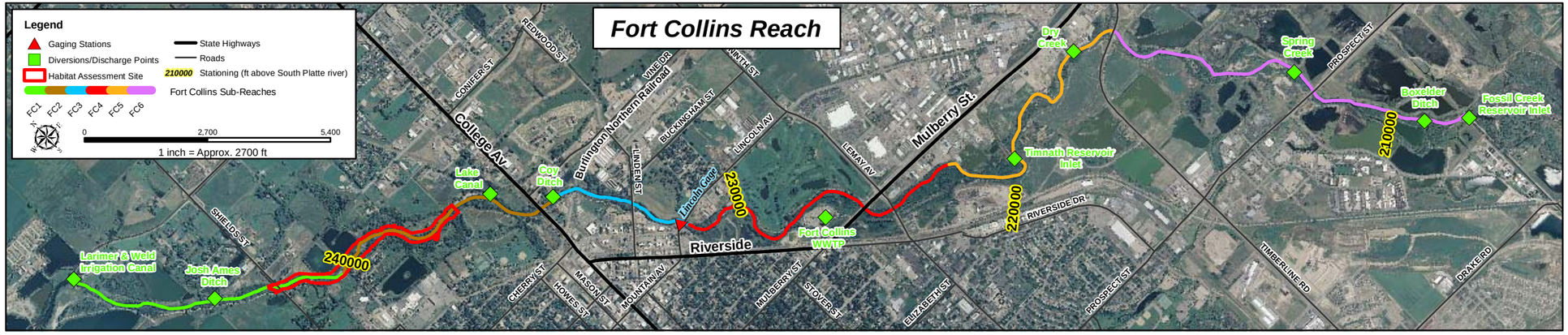
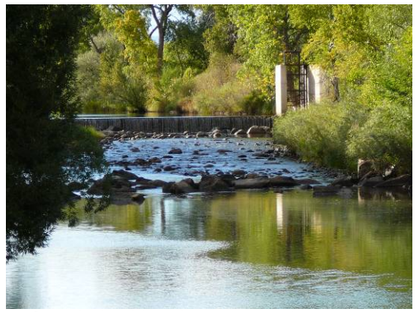
Figure 3.13(b) Fort Collins Reach – from Larimer & Weld Canal (246,435 ft) to Fossil Ck Reservoir Inlet (208,582 ft).

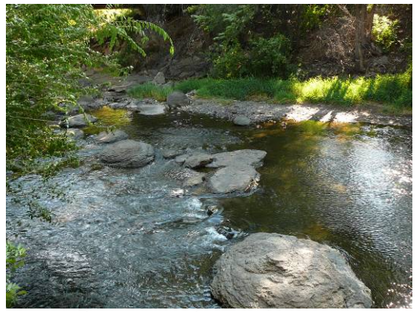
(also see separate descriptions (following) of Fort Collins sub-reaches)



Stable banks, encroaching vegetation.

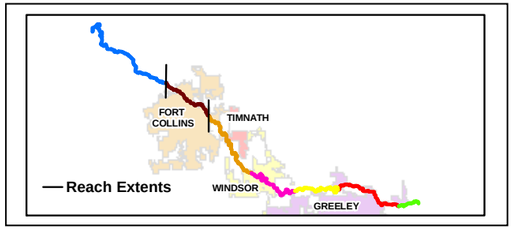


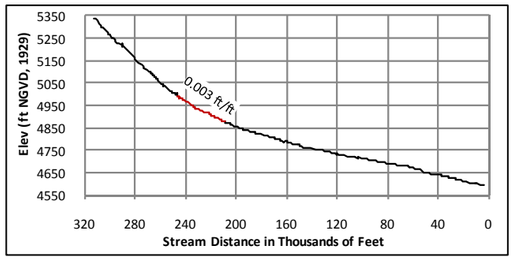
Drop in bed level over Josh Ames Weir.



Bedrock upstream of Linden.

Narrow section upstream of Mulberry.





Average planform characteristics		
Sinuosity	1.13	
Meander wavelength	2320	ft
Meander amplitude	330	ft
Average bankfull characteristics*		
Discharge	6130	cfs
Top width	150	ft
Hydraulic depth	5.9	ft
Average bed material characteristics		
D_{50} surface material	74 (SC)	mm
D_{50} sub-surface material	3.5 (VFG)	mm

*Note: bankfull characteristics are highly variable in this reach

This is a **transitional reach** between the steep reach upstream and the flatter, lowland character downstream. This transitional character is evident on the profile which shows a **variable bed slope** through this reach. Not only are the characteristics of this reach variable because it is in a natural transition zone, but a number of **other influences** also encourage variability of channel characteristics.

- Several **significant diversions** occur in this reach. Each of these diversions has a hydrological impact on the river but it also has a direct physical impact on water levels and bed levels as the result of the diversion structure across the river channel.
- The proximity of Fort Collins leads to a variety of impacts on the channel and on the floodplain associated with **flood control and adjacent urban development**. For example, the aerial photograph shows the location of a levee upstream of Lincoln and extensive channel modifications between the Burlington Northern Railroad and Linden Street.
- There are nine **major bridges** in the reach, offering a variety of hydraulic constrictions and abutment conditions.
- There are areas of **bank protection** using riprap or broken concrete to provide erosion control.
- **Gravel mining** has left extensive floodplain voids in the upstream and downstream parts of the reach.
- A **bicycle and walking trail** follows the river and areas of floodplain have been landscaped for formal and informal parkland.

The combined effect of the natural transitional location and the range of anthropogenic impacts is a **highly variable river character** in this reach. Channel geometry varies significantly from station to station as is evidenced by the wide variability in bankfull flow characteristics and bed material sizes (Figures 3.4 and 3.5). The meander pattern is an exception, exhibiting reasonable regularity at least through the middle part of the reach.

River Processes. Dominant river processes also vary through this reach. Deposition of fine sediments and subsequent growth of stabilizing vegetation on channel margins and bars is a common process – particularly in zones affected by backwater from structures. The underlying bed material appears generally stable, but bank erosion occurs in places – probably as a flood dominated process and often associated with in-channel deposition.

Upstream of Shields Street, the river is straight with mid-channel and side-channel bars stabilized by vegetation. Bed material is typically cobbles overlain by a veneer of fine material, thicker on the vegetating bars and in lee side deposits. Banks are generally stable with encroaching vegetation although there are isolated areas of riprap. Diversion structures mark substantial drops in bed elevation and pool water upstream.

From Shields Street to College Avenue, sinuosity increases and a pool riffle sequence develops. Some gravel is exposed on point bars, however fine material continues to deposit and supports vegetation on channel margins and mid-channel bars. There are several substantial areas of riprap indicating bank instability during higher flows.

Diversion structures and a rock drop structure dominate flow conditions downstream of College Avenue and a substantial bar with a cobble armor has formed just upstream of the railroad. Between the railroad and Linden Street, the river channel is artificially constructed. Downstream of Linden Street through Lincoln Avenue to Mulberry Street, the river maintains a pool riffle sequence but narrows. Bed material is gravel but deposits of fine material support encroaching vegetation on channel margins and mid-channel bars. There is exposed bedrock upstream of Lincoln Avenue. Gravel deposits form a vegetated, partly braided section upstream of Mulberry Street.

The river straightens downstream of Mulberry Street but similarly varying conditions persist. Some sections are dominated by open pool-riffle sequences and others by encroaching vegetation and vegetated mid-channel bars.

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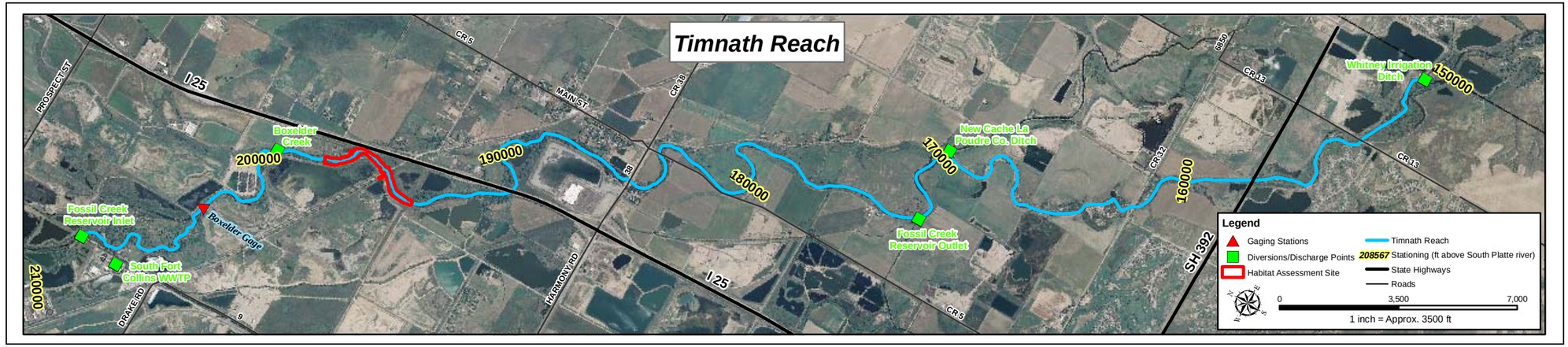
Figure 3.13(c) Timnath Reach – from Fossil Ck Reservoir Inlet (208,582 ft) to Whitney Irrigation Ditch (150,867 ft).

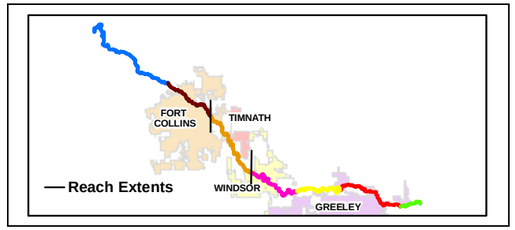
Area of instability upstream of County Rd 32.

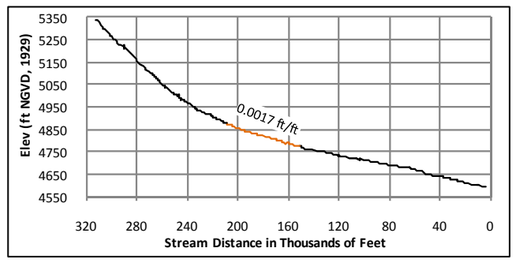
Vegetation encroaching downstream of County Rd 32.

Vegetating mid-channel bar upstream of County Line Rd.

Vegetating side-channel bar upstream of Whitney Ditch.







Average planform characteristics		
Sinuosity	1.34	
Meander wavelength	2520	ft
Meander amplitude	410	ft
Average bankfull characteristics		
Discharge	3024	cfs
Top width	135	ft
Hydraulic depth	4.6	ft
Average bed material characteristics		
D_{50} surface material	62 (VCG)	mm
D_{50} sub-surface material	22 (CG)	mm

This is a reach of moderate sinuosity and flatter bed grade. The grade is constant throughout the reach except for local influences from, for example, diversion weirs and bridges. The effects of bridges at I25 and Harmony Road and the New Cache La Poudre diversion are evident on the profile.

The general reach character is stable, with gravel point bars and mid-channel bars accumulating fine material which subsequently support vigorous vegetation growth. In some locations, the high parts of point bars reflect exposed gravel material because they do not receive regular deposits of fine material and are too high above normal water levels to support vegetation.

Encroaching vegetation is also less dominant where grazing activities are prevalent. Riparian vegetation is sparse throughout much of the reach.

There are some exceptions to this general characterization:

- A section of unstable channel and possible avulsions at the upstream end of the study reach between about 201,500 ft and 205,500 ft. This section has been studied in detail (Anderson Consulting Engineers, Inc. for City of Fort Collins Natural Resources Department, 2001).
- Approximately 7,500 ft of river between the New Cache La Poudre diversion (168,200 ft) and County Road 32 (160,700 ft) exhibits alignment instability with bank erosion associated with point bar development and a recent meander cutoff immediately upstream of County Road 32. This instability could be linked to channelization downstream.
- Between County Road 32 and US392, the river has been straightened and channelized adjacent to gravel mining in the floodplain.
- There is active sedimentation and channel realignment in the weir pool upstream of Whitney Ditch.

River processes. The dominant process apparent in this reach is deposition of fine material (silts and sands) along the channel margins and on mid channel bars, and in lee side deposits that occur behind obstructions such as bridge piers. This material supports the establishment of vegetation which then encourages more sedimentation and so on. This process is ubiquitous in the reach even in the less stable areas that are listed above. This aerial photo extract shows a typical example of encroaching vegetation on sediment deposits downstream of I25.

Isolated bank erosion occurs in the reach – generally on the outside of bends associated with a buildup of bed material and/or vegetation on the adjacent point bar, and occasionally associated with the formation and build up of a mid channel bar.

The effect of floods on this channel type is unpredictable. The ability of a flood to scour out in-channel vegetation will depend on both the magnitude and duration of the flood event and also on the time that is available between floods for vegetation to become established. Where reed canary grass is evident, the likelihood of vegetation removal from flooding is expected to be limited.

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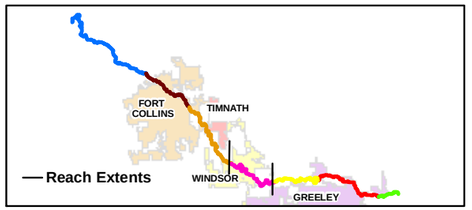
Figure 3.13(d) Windsor Reach – from Whitney Irrigation Ditch (150,867 ft) to Jones Ditch (104,123 ft).

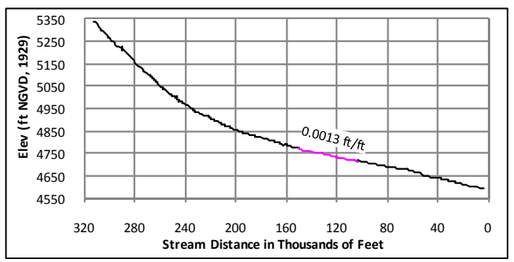
Backwater from major channel blockage downstream of Eaton Ditch.

Typical channel contraction by deposition and encroachment.

Formation of new mid-channel bar downstream of Kodak.

Isolated instance of bank protection.





Average planform characteristics		
Sinuosity	1.58	
Meander wavelength	1930	ft
Meander amplitude	520	ft
Average bankfull characteristics		
Discharge	2360	cfs
Top width	105	ft
Hydraulic depth	5.7	ft
Average bed material characteristics		
D_{50} surface material	9.2 (MG)	mm
D_{50} sub-surface material	NA	mm

This reach is differentiated from the Timnath Reach upstream by a **significant reduction in grade** with a corresponding increase in sinuosity. The depositing material is predominantly **medium to fine sand**. The **depositional trend** in the upstream reach becomes more evident within the Windsor Reach.

The river is actively **narrowing and shallowing** through this reach. The narrowing process occurs through several related mechanisms:

- At meander crossovers (or riffles), **vegetation is invading the riffle zone** encroaching from one or sometimes both banks. The vegetation encourages deposition of fine material which encourages more vegetation. Substantial narrowing occurs at these locations. The width of the low flow channel has been reduced to less than 15 feet at many of the riffle sections in this reach.
- Deposition occurs upstream and downstream of channel obstructions such as bridge piers and in-channel debris. The deposition forms into **mid-channel bars** that are subsequently stabilized and affirmed by vegetation. Deposition can also commence in the absence of an obvious obstruction as the result of eddies near the bank or some other flow anomaly. As the zone of deposition reaches the normal water level, vegetation rapidly establishes and subsequent deposition is accelerated.
- **Point bars** on meander bends develop a margin of vegetation along with deposits of sands and silts. The vegetated margin encourages further deposition which extends into the stream through time.

Riparian vegetation is discontinuous and generally in a very narrow band adjacent to the channel and in the channel itself. The exception is areas of siltation or old (abandoned) channels which are densely vegetated in some places.

River processes. Through this reach, the **interaction between deposition and vegetation** has resulted in numerous examples of In-channel constrictions. Some are shown in the adjacent photographs commencing with the island immediately downstream of the Eaton Ditch headgate.

In spite of the dominant depositional processes, there are **isolated instances of bank erosion** that have necessitated the placement of stabilization measures including rock riprap and rock groins. These are generally associated with mid-channel bars or growth of point bars on the opposite bank.

There are two notable local anthropogenic impacts in this reach.

- **Extensive gravel extraction** has taken place adjacent to and upstream of the Windsor urban area. Between Eastman Park and US Highway 257, the river now flows on an elevated ridge flanked by a golf course and extensive gravel pits (now inactive) that are being used as urban lakes.
- Further downstream, adjacent to the Kodak plant (around station 118,400 ft), the **river is confined** through a 10ft by 10ft culvert. This appears to restrict flows around a meander bend in the vicinity of a Kodak waste water treatment facility. To compensate for this constriction, a flood channel has been constructed across the meander bend. Approximately 4,600 ft of river channel is isolated from flood flows by this arrangement.

Despite the observation of channel contraction throughout the reach, it is possible that flood events could still scour vegetation and rejuvenate the channel. The prognosis for the reach under existing conditions is controlled by a complex interaction between deposition of sands and silts and the associated establishment of vegetation offset by the possible occurrence of floods of sufficient magnitude and duration to remove in-channel vegetation and scour out the channel. Channel trajectory depends on whether the recovery time between floods is sufficient for the vegetation to establish sufficiently to resist the magnitude of the next flood event. Evidence to date suggests that where reed canary grass is evident, the likelihood or vegetation removal from flooding is limited.

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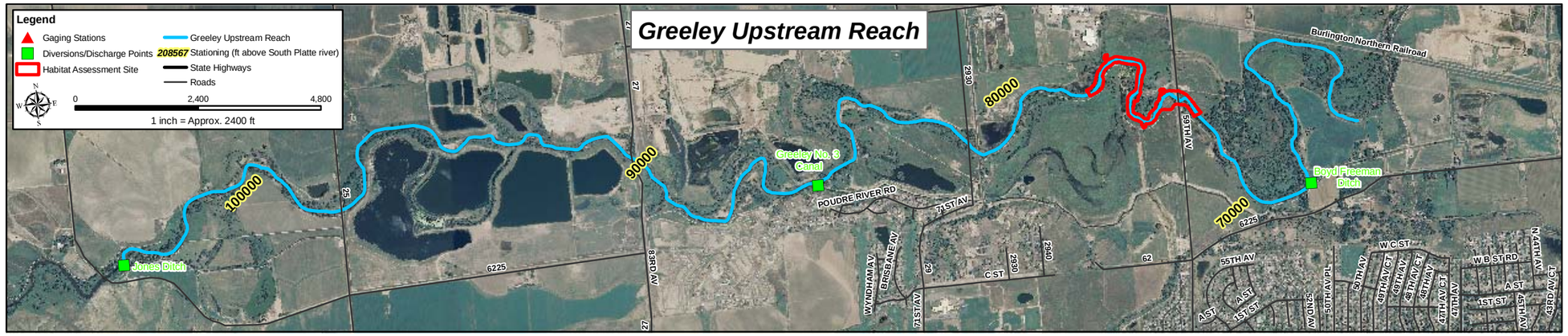
Figure 3.13(e) Greeley Upstream Reach – from Jones Ditch (104,123 ft) to Burlington Northern Railroad (62,102 ft).

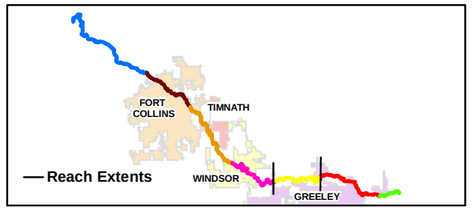
Bank protection following meander migration and channel contraction.

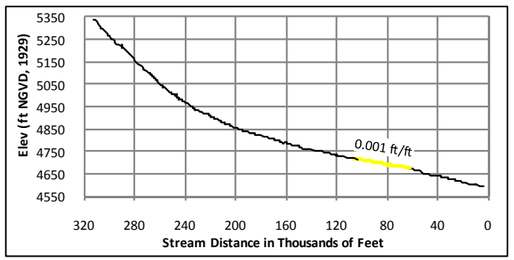
Narrow channel downstream of Greeley No. 3 Canal.

Limited deposition and vegetation on margin of point bar.

Wide shallow section of channel upstream of railway.







Average planform characteristics		
Sinuosity	1.65	
Meander wavelength	2080	ft
Meander amplitude	350	ft
Average bankfull characteristics*		
Discharge	1905	cfs
Top width	135	ft
Hydraulic depth	4.1	ft
Average bed material characteristics		
D_{50} surface material	7.6 (FG)	mm
D_{50} sub-surface material	NA	mm

*

This reach is differentiated by an **anomaly in the bed profile**. Through this reach the bed profile exhibits a significant hump, with the bed rising above the expected grade (the bed slope both upstream and downstream) by as much as 15 feet.

Bankfull discharge together with channel dimensions, particularly channel depth, continue to decrease through the reach.

In planform, the sinuosity increases moderately over the Windsor reach but meander amplitude decreases probably associated with historic gravel mining and meander cutoffs.

Within this reach, extensive areas of floodplain have been excavated for gravel and now remain as ponds. The Greeley No. 3 Canal headgate is located toward the middle of this reach.

In at least the upstream half of this reach, the **depositional trend** of the upstream reaches is well established and dominant. However from around the road crossing at 71st Avenue, the depositional character changes. Downstream from this point, the depositional process appears to be more dominant and less dependent on the establishment of vegetation. In places, between here and the Burlington Northern Railroad, deposition across the channel has confined the entire cross section to only a few feet deep and a few yards wide. It is important to note, however, that there is more gravel apparent on bars in the channel, suggesting that flows are able to scour the finer material more regularly than in the deeper sections upstream.

There is more evidence of alignment instability in this reach which is reflected in more examples of **bank erosion** associated either with ongoing meander development or with channel constriction by deposition. Some bank erosion has been stabilized with rock or other measures. Where bank erosion is occurring and no stabilization measures have been installed, the rates of erosion appear to be slow.

River Processes. The dominant process in the **upstream** part of the reach is channel constriction through deposition and associated establishment of vegetation. In common with the Windsor Reach upstream, it appears that floods have been either too infrequent or too short to interrupt or constrain the process of channel constriction from deposition, vegetation establishment and further deposition. Consequently, now that vegetation is well established, **the process of channel constriction is likely to continue,** even if temporarily interrupted during occasional large floods.

The dominant processes in the **downstream** part of this reach are less clear. Superimposed on the constriction-deposition-vegetation process described above, there is evidence of cyclical broad scale deposition and scour within the channel. There appears to be less reliance on vegetation to stabilize and accelerate deposition, but deposition is still the dominant process. Under current conditions, the balance between scour and deposition is expected to continue to fluctuate, and some erosion is to be expected during floods. Similar to the Windsor and Timnath Reaches, where reed canary grass is evident, the likelihood of vegetation removal from flooding is expected to be limited.

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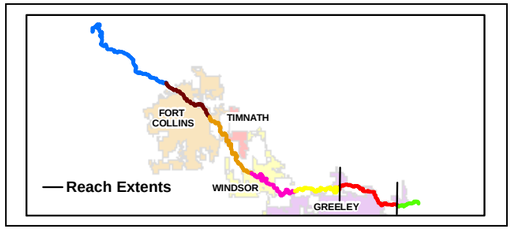
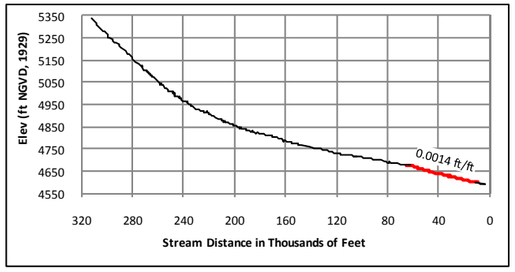
Figure 3.13(f) Greeley Channelized Reach – from Burlington Northern Railway (62,102 ft) to Greeley Gage (15,120 ft).





Average planform characteristics		
Sinuosity	1.14	
Meander wavelength	2290	ft
Meander amplitude	230	ft
Average bankfull characteristics*		
Discharge	6570	cfs
Top width	130	ft
Hydraulic depth	8.1	ft
Average bed material characteristics		
D_{50} surface material	11.2 (MG)	mm
D_{50} sub-surface material	NA	mm

Artificial channel, levee on right bank.

Narrow active channel flanked by vegetated benches.

Heavily modified channel through urban area.

Steep bed in active channel. Potential headcut.

The river through this reach has been heavily modified both in alignment and in cross section. In the upstream half of the reach, the modification has been associated with historic gravel mining. Further downstream the modifications are also associated with urban encroachment and development.

The effect of these modifications can be seen in the sudden drop in sinuosity from 1.65 in the upstream reach to 1.14 in the Greeley Channelized Reach. The impact is also starkly portrayed in the average bankfull characteristics where depth, flow area and bankfull flow are significantly greater than in either upstream or downstream reaches (see Table opposite and Figure 3.4).

Through the gravel mining zone, the river has been straightened and is closely confined by levee banks to a width ranging from 150 to 200 ft. Within this broader cross section, the active channel is narrow, as little as 12 ft wide in some locations, with a series of vegetated benches extending from the channel out to the levees. Gravel bars are present but intermittent. Many of the banks are armored, generally with broken concrete.

The river is unusually steep through the gravel mining portion of this reach with a bed slope more similar to the Fort Collins Reach than to its neighboring reaches upstream or downstream.

The channelized character continues through the gravel mining zone and then the urbanized section of Greeley. The channel is not as steep in this section but channel character is similar.

Extensive investigatory work is underway in this vicinity as part of the Cache La Poudre River General Investigation Study[1] This detailed investigation is exploring projects that will reduce flood damages at the same time as providing environmental, recreational and aesthetic opportunity. The investigation involves the City of Greeley, the US Army Corps of Engineers and the Colorado Water Conservation Board

River Processes. Overall, despite the relatively steep slope and high bankfull flows, the channel in this reach appears stable. While some deposition zones are evident, there is not the widespread active channel narrowing here that is occurring upstream. Channel bank erosion is evident in the gravel mining zone, however, the erosion appears to be actively managed through placement of stabilization measures. There is the potential for some bed instability but only one potential head cut was observed (see adjacent photo).

[1](www.Greeleygov.com/Engineering/CacheLaPoudre.aspx)

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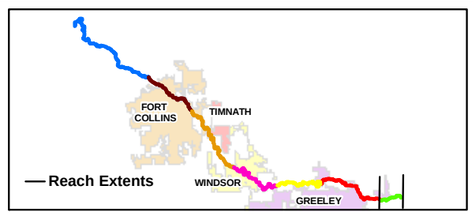
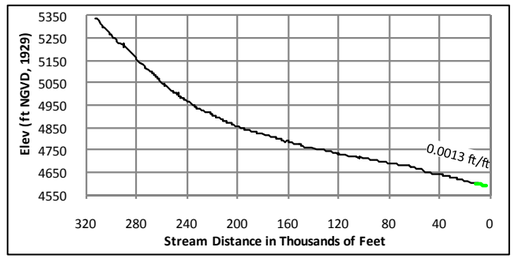
Active channel flanked by grassed benches.

Active channel flanked by grassed benches.

Figure 3.13(g) Greeley Downstream Reach – from Greeley Gage (15,120 ft) to South Platte River.





Average planform characteristics		
Sinuosity	1.19	
Meander wavelength	1130	ft
Meander amplitude	120	ft
Average bankfull characteristics*		
Discharge	1080	cfs
Top width	95	ft
Hydraulic depth	3.3	ft
Average bed material characteristics		
D_{50} surface material	1.0 (CS)	mm
D_{50} sub-surface material	NA	mm

From Greeley Gage to the South Platte River, The Cache la Poudre becomes smaller and shallower and exhibits a substantial drop in bankfull capacity. Deposition is evident on bars and deposition patterns are also discernible on the floodplain. Low lying bars are vegetated but the higher deposition zones have not been colonized.

A tributary known as Sand Creek flows into the river near the upstream end of this reach. Based on field observations, Sand Creek appears to contribute a high sediment load to the river at this location.

There has been substantial artificial straightening of the river in this reach.

River Processes. This reach can be characterized as a historic zone of deposition– both on the floodplain and in the channel. Depending on the magnitude of the historic depositional events, changes in channel alignment may have also occurred in this reach. There is no evidence of contemporary alignment instability.

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APPENDIX F

PROPOSED CONCEPTUAL MITIGATION PLAN

APPENDIX F

PROPOSED CONCEPTUAL MITIGATION PLAN

Appendix F
Proposed Conceptual Mitigation Plan

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NISP
Northern Water
Northern Integrated Supply Project

Proposed Conceptual Mitigation Plan

APRIL 27, 2015

Northern Integrated Supply Project
Supplemental Draft Environmental Impact Statement

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Proposed Conceptual Mitigation Plan

Northern Integrated Supply Project
Supplemental Draft Environmental Impact Statement

Prepared By:
Northern Water
Northern Integrated Supply Project Water Activity Enterprise
220 Water Avenue
Berthoud, CO 80513
800-369-7246

Prepared For:
U. S. Army Corps of Engineers
Omaha District

APRIL 27, 2015

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SECTION 1. INTRODUCTION

1.1 Project Overview

The U.S. Army Corps of Engineers (Corps) is preparing a Supplemental Draft Environmental Impact Statement (SDEIS) for the Northern Integrated Supply Project (NISP). NISP is a proposed water storage and distribution project that will supply 15 Northern Front Range water providers (Participants) with 40,000 acre feet of new, reliable water supplies. As proposed, NISP would consist of two new reservoirs; forebay reservoirs and pumping plants to deliver water from the Cache la Poudre (Poudre) and South Platte rivers to the reservoirs; pipelines to deliver water for exchange with irrigation companies and to deliver water to water users; and improvements to existing canals that divert water from the Poudre River near the canyon mouth west of Fort Collins. NISP is being managed by the Northern Colorado Water Conservancy District (Northern Water) Northern Integrated Supply Project Water Activity Enterprise, which is referred to as Northern Water throughout the remainder of this document.

The Participants are a group of rapidly growing communities and domestic water districts located throughout Northern Water district boundaries, and include Central Weld County Water District, Town of Dacono, Town of Eaton, Town of Erie, City of Evans, Town of Firestone, Fort Collins-Loveland Water District, City of Fort Lupton, City of Fort Morgan, Town of Frederick, City of Lafayette, Left Hand Water District, Morgan County Quality Water District, Town of Severance, and the Town of Windsor. The proposed Project would be constructed and owned by Northern Water. While Northern Water would retain ownership and operational responsibility of the Project, the Participants would own a perpetual contractual right to a defined portion of the Project facilities and a defined portion of the water diverted by the Project.

The SDEIS is being prepared in compliance with the Corps National Environmental Policy Act (NEPA) implementation procedures for its regulatory program (Appendix B of 33 CFR Part 325), and addresses factors relevant to the 404(b)(1) guidelines (40 CFR Part 230) and applicable public interest review criteria identified at 33 CFR Part 320.4. Based on a review of the Project, the Corps determined that the Project may significantly affect the quality of the human environment. Because the proposed Project will involve the discharge of dredge and fill material into wetlands or other waters of the U.S., Northern Water is seeking a permit under Section 404 of the Clean Water Act. The Corps is the lead federal agency for compliance with NEPA and will use the EIS in rendering a final permit decision.

Four alternatives were selected for detailed evaluation in the SDEIS:

- Alternative 1 – No Action Alternative: Construct Cactus Hill Reservoir and perform substantial agricultural water transfers

- Alternative 2 – Proposed Action (Northern Water's preferred alternative): Construct Glade Reservoir and the South Platte Water Conservation Project (SPWCP)
- Alternative 3 – Construct Cactus Hill Reservoir with a Poudre Valley Canal diversion, and the SPWCP
- Alternative 4 – Construct Cactus Hill Reservoir with multiple downstream diversions, and the SPWCP

Analyses performed by SDEIS resource specialists show that implementation of any of the alternatives would unavoidably affect the human environment. Northern Water and the Participants are committed to implementing avoidance and minimization techniques during project design, construction and operations. For those effects that cannot be avoided or minimized through project design, construction and operation, Northern Water proposes to implement compensatory mitigation to mitigate the effects of NISP.

1.2 Purpose of Conceptual Mitigation Plan

This draft Conceptual Mitigation Plan outlines the proposed avoidance, minimization and compensatory mitigation for key environmental resources, including water quality, stream morphology, fish and other aquatic life, wetlands, riparian vegetation, and terrestrial wildlife. Additional mitigation techniques may be outlined in the SDEIS. This Conceptual Mitigation Plan describes proposed mitigation for Alternative 2 – Proposed Action only. The summary table in Appendix A denotes the applicability of these mitigation measures to other action alternatives. Maps showing the approximate locations of the proposed mitigation for Alternative 2 are presented in Appendix B.

Between the SDEIS and Final Environmental Impact Statement (FEIS), the conceptual mitigation plan will be refined to reflect input from the state fish and wildlife mitigation planning process, the state water quality certification process, more detailed mitigation planning, and direction from the Corps regarding Clean Water Act section 404 compliance considerations (see section 1.4 for a description of these processes). Ultimately, the Corps, if a permit is issued for the project, will be responsible for ensuring that Northern Water adheres to the mitigation requirements outlined in the FEIS, and/or Corps permits.

1.3 Contents of the Conceptual Mitigation Plan

The Conceptual Mitigation Plan includes the following sections:

- The **Introduction (Section 1)** provides a description of the Project, purpose of the conceptual mitigation plan, regulatory framework, conceptual mitigation approach, and description of other pertinent projects within the area.

- **Mitigation Goals and Objectives (Section 2)** provides an overview of the environmental effects and the general approach of the Conceptual Mitigation Plan in mitigating these effects. The mitigation approaches have been separated from the mitigation activities because, where possible, many of the mitigation activities are designed to take a holistic view of the environmental resources and mitigate several effects with specific projects.
- **Avoidance, Minimization and Other Commitments (Section 3)** provides a summary of mitigation measures that are designed to avoid and minimize effects, as well as activities that have already been committed to through design and operation of the proposed facilities.
- **Compensatory Mitigation (Section 4)** provides a summary of mitigation measures designed to compensate for unavoidable adverse effects which remain after avoidance and minimization.
- The **Implementation Schedule (Section 5)** contains a broad-level schedule for implementation of the proposed mitigation measures.
- **Appendix A – Summary of Conceptual Mitigation Plan** contains a tabular summary of the mitigation measures, including categorization of the authority under which the mitigation is proposed, and the mitigation type. Due to the abbreviated format of the table, it is recommended that the text of the Plan be consulted for further explanation of these measures.

1.4 Regulatory Framework

1.4.1 Clean Water Act/National Environmental Policy Act

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the U.S., including jurisdictional wetlands. Northern Water is seeking a permit under Section 404 for construction and operation of the proposed facilities. The U.S. Environmental Protection Agency (EPA) and the Corps have articulated the policy and procedures to be used in the determination of the type and level of mitigation necessary to demonstrate compliance with the Section 404(b)(1) Guidelines of the Clean Water Act in the Mitigation Rule (33 CFR Part 332). Among other issues, the Mitigation Rule states that "the district engineer will issue an individual section 404 permit only upon a determination that the proposed discharge complies with applicable provisions of 40 CFR Part 230, including those which require the permit applicant to take all appropriate and practicable steps to avoid and minimize adverse impacts to waters of the United States. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Compensatory mitigation for

unavoidable impacts may be required to ensure that an activity requiring a section 404 permit complies with the Section 404(b)(1) Guidelines."

The Council on Environmental Quality defines mitigation to include:

> (a) Avoiding the impact altogether by not taking a certain action or parts of an action;
>
> (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
>
> (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
>
> (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
>
> (e) Compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

For all practical purposes, the 1990 Memorandum of Agreement between the Corps and EPA categorizes these to three general types: avoidance, minimization and compensatory mitigation (Page and Wilcher 1990). The memorandum of agreement also defines a sequence of actions that must be followed to offset impacts to aquatic resources:

- **Avoidance** – No discharge shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.
- **Minimization** – Appropriate and practicable steps to minimize the adverse impacts will be required through project modifications and permit conditions.
- **Compensatory Mitigation** – Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been required.

Compensatory mitigation is required for discharges authorized under a Clean Water Act Section 404 permit when adverse impacts to wetlands, streams and other aquatic resources cannot be avoided or minimized. The Army Corps of Engineers is responsible for determining the appropriate form and amount of compensatory mitigation required for a Clean Water Act Section 404 permit. Methods of compensatory mitigation include restoration, establishment, enhancement and preservation (EPA 2014).

- **Restoration**: Re-establishment or rehabilitation of a wetland or other aquatic resource with the goal of returning natural or historic functions and characteristics

to a former or degraded wetland. Restoration may result in a gain in wetland function or wetland acres, or both.

- **Establishment (Creation)**: The development of a wetland or other aquatic resource where a wetland did not previously exist through manipulation of the physical, chemical and/or biological characteristics of the site. Successful establishment results in a net gain in wetland acres and function.

- **Enhancement**: Activities conducted within existing wetlands that heighten, intensify, or improve one or more wetland functions. Enhancement is often undertaken for a specific purpose such as to improve water quality, flood water retention, or wildlife habitat. Enhancement results in a gain in wetland function, but does not result in a net gain in wetland acres.

- **Preservation**: The permanent protection of ecologically important wetlands or other aquatic resources through the implementation of appropriate legal and physical mechanisms (e.g. conservation easements, title transfers). Preservation may include protection of upland areas adjacent to wetlands as necessary to ensure protection or enhancement of the aquatic ecosystem.

1.4.2 Endangered Species Act

Section 7(a)(2) of the Endangered Species Act requires that federal agencies consult with the U.S. Fish and Wildlife Service (Service) to ensure that effects of actions that the federal agencies authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat. During this consultation, the federal agency receives a biological opinion or concurrence letter addressing the proposed action (Service 2014).

The Corps submitted a biological assessment to the Service for the NISP proposed action (alternative 2; Corps 2007) and has consulted with the Service under Section 7. The Service issued a biological opinion on NISP on October 5, 2007 (Service 2007)[1]. The opinion concurs with the biological assessment that NISP is "not likely to adversely affect" the Colorado butterfly plant (*Gaura neomexicana* ssp. *Coloradensis*), the Ute ladies'-tresses orchid (*Spiranthes diluvialis*), and the black-footed ferret (*Mustela nigripes*). The opinion requests that suitable habitat for the Colorado butterfly plant and the Ute ladies'-tresses orchid be resurveyed prior to disturbance. The opinion concludes that the NISP proposed action is not likely to jeopardize the continued existence of the threatened Preble's meadow jumping mouse (*Zapus hunsonius preblei*), due to 1) permanent and temporary impacts to available habitat are not likely to preclude recovery of the species; 2) the

[1] The information in this section and the mitigation plan will be modified as required prior to the FEIS based on the final biological opinion.

Project would not preclude the Service's ability to recover the species; and 3) the Project would implement proposed compensatory mitigation measures through enhancement of existing habitat and creation of new habitat below the proposed Glade Reservoir. The opinion also authorizes incidental take and identifies reasonable and prudent measures, terms and conditions, and reporting requirements for such take. Preble's meadow jumping mouse mitigation is described in this Conceptual Mitigation Plan.

The opinion also concurs with the assessment of effects on listed species that use the Platte River in Nebraska, including the endangered whooping crane (*Grus Americana*), the interior least tern (*Sternula antillarum*), the pallid sturgeon (*Scaphirynchus albus*), the piping plover (*Charadrius melodus*), and the western prairie fringed orchid (*Platanthera praeclara*). The opinion concludes that the NISP proposed action is consistent with the Tier 1 Programmatic Biological Opinion on the Platte River Recovery Implementation Program, and is not likely to jeopardize the continued existence of these federally listed species and is not likely to destroy or adversely modify designed critical habitat for the whooping crane. The opinion also addresses reasonable and prudent measures and terms and conditions in the Tier 1 Programmatic Biological Opinion regarding incidental take, and conservation measures.

1.4.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. § 470, et seq.) requires all federal agencies to consider effects of any federal action on cultural resources eligible for or listed in the National Register of Historic Places prior to initiating such actions. For NISP, the NEPA process will be used by the Corps to satisfy Section 106 compliance requirements.

The Corps has notified the State Historical Preservation Office and Advisory Council on Historic Preservation of these intentions, identified and contacted consulting parties (including Native American tribes), and identified historic properties in a manner consistent with Section 106. A draft Programmatic Agreement has been developed to address cultural resources and is contained in the SDEIS. The Programmatic Agreement will serve as the official compliance document for Section 106 of the National Historic Preservation Act and will be referenced in the Record of Decision for NISP, if permitted.

1.4.4 State of Colorado

Although there are numerous State statutes and regulations that pertain to specific parts of the Conceptual Mitigation Plan, there are two key state-level requirements that guide its development: the State Fish and Wildlife Mitigation Plan and State Section 401 water quality certification.

1.4.4.1 Fish and Wildlife Mitigation Plan

The State of Colorado requires development of a Fish and Wildlife Mitigation Plan (C.R.S. §37-60-122.2). The statute requires that an applicant for any water diversion, delivery, or storage facility which requires an application for a permit, license, or other approval from the United States shall inform the Colorado Water Conservation Board, Wildlife Commission, and Division of Wildlife (now Colorado Parks and Wildlife, CPW) of its application and submit a mitigation proposal. The express intent of the State statute is that project impacts to fish and wildlife resources should be mitigated in a manner that is economically reasonable and maintains a balance between the development of the State's water resources and the protection of fish and wildlife resources. If the applicant and the Wildlife Commission come to agreement on the mitigation plan, the Wildlife Commission shall forward the agreement to the Colorado Water Conservation Board, which shall adopt the agreement as the official State position on the mitigation actions required of the applicant.

Northern Water received comments from CPW on the Draft EIS. Because agency and public review of the SDEIS is critical to development and review of the state mitigation plan, detailed discussions with state agencies and development of the state plan cannot begin until after the SDEIS is released for public review. Therefore, this Conceptual Mitigation Plan does not contain mitigation activities that may be required under the state mitigation plan. Any requirements and commitments specific to the state mitigation plan will be incorporated into the NISP final mitigation plan.

1.4.4.2 Section 401 Certification

Section 401 of the Clean Water Act requires water quality certification for any federal license or permit that is issued to construct or operate a facility which may result in fill or discharge into navigable waters of the U.S. The Colorado Water Quality Control Division reviews and issues these certifications for projects or actions under provisions of the 401 Certification Regulation (Water Quality Control Division Regulation #82, 5 C.C.R. 1002-82; Colorado Department of Health and Environment 2014).

As with the state mitigation plan, release of the SDEIS is a key step in the application, review and certification process. Therefore, the 401 certification process cannot begin in earnest until the SDEIS is released. Any requirements and commitments specific to the 401 certification process will be incorporated into the final mitigation plan.

1.4.5 Local Agencies

NISP effects occur primarily in the Poudre River from the mouth of the Canyon west of Fort Collins through its confluence with the South Platte near Greeley. There are several communities along this reach of river that have planning documents for, sponsor projects

in, and own land adjacent to the river, including the City of Fort Collins, Town of Windsor and City of Greeley (see Section 1.6).

Although these communities do not have regulatory authority to enforce mitigation for effects of the project, Northern Water has been in contact with these communities during the Conceptual Mitigation Plan development process, and will continue to coordinate with the communities during additional mitigation planning and implementation. Additional information on these communities' planning and related river activities is discussed in Section 1.6.

1.5 Conceptual Mitigation Approach

The approach for the Conceptual Mitigation Plan was developed based on federal requirements, the nature of environmental effects, and comments received on the Draft EIS. In general, guidelines were developed that guide the location, spatial content, benefits and ecological functions of mitigation activities (Table 1). These guidelines are further defined below.

Table 1. Approach for Conceptual Mitigation Plan

Guideline	Explanation
Prioritize Location of Mitigation Activities	The locations of mitigation activities are prioritized as follows: on-site, channel reach, adjacent reaches.
Consider the Context of Mitigation Activities	Mitigation activities are scaled to a landscape level for the environmental resource.
Account for Overlap of Environmental Benefits	Where possible, mitigation measures are developed to provide benefit for more than one environmental resource.
Replace lost environmental resources and ecological functions	Mitigation activities fully replace, and in most cases improve, environmental resources and ecological functions.

1.5.1 Location of Mitigation Activities

In general, the location of mitigation activities is developed as close as possible to the location at which the effect occurs. For site specific mitigation activities, such as disturbance of a specific quantity of wetlands at a construction site, the disturbance is mitigated on the same site if the site is amenable to the activity. On-site, in the case of NISP, applies to land that is owned by Northern Water, such as land at the reservoir sites. On-site mitigation provides assurance that the land can be acquired and the mitigation fully implemented as conceptualized.

For NISP, the majority of the effects and associated mitigation activities occur in the river channels. These effects are indirectly caused by a change in hydrology rather than directly by a construction activity. Under this Plan, environmental effects in one reach of river are generally mitigated in the same reach of river. For instance, mitigation of riparian effects that occur in Segment E is generally mitigated in Segment E. It should be noted that the

resource specialists used differing reaches for analyses tailored to the nature of each resource. A general summary of the reaches is presented in Table 2.

Table 2. Approximate Demarcation of Resource Study Reaches

General Area	Aquatic and Riparian Vegetation Segment	Geomorphic and Sediment Transport Study Reach	Approximate Upstream Demarcation [1]		
			Data Delivery Mile [2]	Diversion or Water Feature	Major Road/Landmark
La Porte	A	La Porte	5.12	Poudre Valley Canal	Canyon Mouth
Fort Collins Upstream	B	Fort Collins 1-4	13.92	Larimer & Weld Canal	Taft Hill Road
Fort Collins Downstream	C	Fort Collins 5-6	18.71	Timnath Inlet	Prospect Road/ Spring Creek
Timnath	D	Timnath	27.81	New Cache la Poudre Ditch	Kechter Road (5 river miles downstream of I-25)
Windsor	E	Windsor	31.61	Whitney Ditch	Weld County Road 17/7th Avenue (Windsor)
Greeley	F	Greeley (Upstream, Channelized, Downstream)	40.79	Jones Ditch	Weld County Road 25/95th Avenue (Greeley)

[1] Because reach definitions differ by resource, the specific upstream demarcation between reaches differs by resource. This table is an approximation only – see specific resource reports for exact demarcations.
[2] DDM = Data Delivery Mile; distance downstream of Munroe Canal diversion.

For physical mitigation projects, especially those that involve habitat or channel improvements, reaches in which a public entity owns land on either or both sides of the river channel were prioritized. This results in a streamlined implementation process, and allows public access to these improvements in most cases.

1.5.2 Context of Mitigation Activities

Mitigation will occur in a watershed context. All mitigation takes place in the Poudre or the South Platte watershed. The extent of mitigation activities varies by the resource being mitigated. For instance, mitigation sites for the Preble's meadow jumping mouse are restricted to areas in which Preble's meadow jumping mouse habitat naturally occurs. Similarly, mitigation activities for certain types of riparian vegetation can only take place where that vegetation is expected to occur and be successful.

Mitigation activities are implemented at a project scale in which the activity can be successful. For channel mitigation activities, rather than rehabilitation of short reaches of river, longer contiguous reaches are selected so that the mitigation activity occurs at a meaningful scale.

1.5.3 Overlap of Mitigation Activities

Where possible, mitigation activities are designed to improve multiple environmental resources. For instance, in many cases, channel improvement activities are designed not only to mitigate geomorphic resources, but also aquatic resource effects and/or riparian resource effects. This does not imply that the amount of mitigation is lessened (i.e. double counted). Rather the specific resource mitigation activity takes a holistic view of the channel conditions, and often results in benefits to multiple resources (sometimes, improving a resource beyond its pre-mitigation levels).

1.5.4 Replace Ecological Function

Mitigation activities are intended to fully mitigate an affected resource, and in many cases, enhance environmental resources and ecological functions. Mitigation activities are not designed to return the river to a "native," or "pre-human disturbance" condition. Rather, mitigation activities mitigate the effects of the NISP project, and are designed to be successful given existing and future conditions.

1.6 Concurrent and Related Activities

1.6.1 Halligan and Seaman Projects

The Halligan Project is proposed by the City of Fort Collins to enlarge its existing Halligan Reservoir, located on the North Fork of the Poudre River approximately 9 miles northwest of Livermore. The Seaman Project is proposed by the City of Greeley to enlarge its existing Milton Seaman Reservoir located on the North Fork of the Poudre River just upstream of its confluence with the Poudre mainstem. In order to fill and operate the additional storage space, the projects will have flow-related effects on the Poudre River in similar reaches as NISP.

Fort Collins and Greeley are currently undergoing separate NEPA compliance efforts for these projects, which will result in two separate Section 404 permits from the Corps, if permits are issued. The Corps is the lead federal agency for both projects. The Draft EIS for the Halligan project is currently scheduled to be released in the spring of 2016. The Draft EIS for the Seaman project would be released subsequent to the Draft EIS's.

The Corps developed the common technical platform to assist in the assessment of impacts associated with NISP, the Halligan project, and the Seaman project. The common technical platform developed baseline study conditions for NEPA analyses by these projects, including hydrologic modeling, geomorphology, aquatic, water quality, and riparian resources. Cumulative effects hydrologic model runs (Future Conditions runs) and corresponding resource analyses consider operations of NISP, the Halligan project, and the Seaman project, in addition to other reasonably foreseeable future actions.

Because the Draft EIS's for the Halligan and Seaman projects have not yet been released, it is not known at this time the location or significance of environmental effects or mitigation requirements for these effects. Northern Water is likely to develop and begin implementation of mitigation activities sooner than these projects. Until more details are available on the Halligan and Seaman projects, it is unknown exactly how mitigation activities will be coordinated between the projects. However, Northern Water fully expects to coordinate operations and mitigation activities, where appropriate, with these other proposed projects.

1.6.2 The Poudre Runs Through It

The Poudre Runs Through It Study/Action Work Group is made up of about 25 citizen experts representing diverse interests who were selected to study the Poudre River and formulate cooperative actions based on what they learn. The group is organized and facilitated by the Colorado Water Institute and Colorado State University. The group is trying to find broadly acceptable ways to meet multiple objectives: to have both a working Poudre and a healthier Poudre. The group's goal is not to return the river to its pre-development condition, but rather to focus on areas for mutual gain without letting divisive issues inhibit thinking. The group has launched three initiatives towards these goals that fall under the categories of Flows, Funding, and Forum (Poudre Runs Through It 2014). Northern Water actively participates in the group.

1.6.2.1 Flows

The Poudre Runs Through It group has investigated two distinct approaches to keep more water in the Poudre River. The key to each is using the river, instead of canals or pipelines, as a conveyance to move water from upstream to a downstream beneficial use, and moving that water in a way that minimizes losses, does not interfere with water rights, can be administered under Colorado water law, and is market driven.

> **Approach A: Instream Flow Designation** – This approach involves requesting that the Colorado Water Conservation Board secure instream flow water rights for a specific reach of the Poudre River. Minimum flow designation is recognized by Colorado law, established by the Colorado Water Conservation Board in conjunction with CPW, and water dedicated to such a reach is administered within the state's water right priority system. One potential reach would be the Poudre River through Fort Collins. Water leased or otherwise acquired upstream of Fort Collins could then be run through the designated instream flow reach, applied to the beneficial use created by an instream flow right in the designated reach, and used in turn by downstream agricultural or other users (Poudre Runs Through It 2014).

The instream flow water right would be junior to all existing perfected and conditionally decreed water rights on the river, including NISP water rights. However, it would provide the mechanism for the lease and/or purchase of water rights to be dedicated for instream flow purposes.

Approach B: Regional Conveyance Cooperation – This approach would involve the cooperation and coordination of water users and stakeholders to modify operations with the goal of leaving more water in the river during critical low-flow periods. For example, cities or water districts that currently divert water from the Poudre River upstream from Fort Collins or plan to do so in the future could, during certain times or under certain conditions, move all or part of that water further downstream in the Poudre through Fort Collins and perhaps Windsor before diverting it to other uses. Using the river as a conveyance could add water back into a portion of the Poudre (Poudre Runs Through It 2014b).

Both approaches would require replacement, retrofitting, enhancement or construction of major infrastructure at treatment plants, diversion and head gates, as well as adding telemetered flow measurement. Both would also require new cooperative agreements among water rights holders to maximize the efficiency of the river for both working and healthy river goals.

Any approach to improving flows will involve considerable expense and therefore require public support. The group has identified as a priority broadening public understanding of key water management concepts (Poudre Runs Through It 2014).

1.6.2.2 Funding

Improvements being envisioned by the Poudre Runs Through It group will require funding for implementation, including engineering and legal fees, retrofit of infrastructure, flow measurement, extensive educational campaigns, and/or the lease or purchase of water rights. The Poudre Runs Through It has undertaken an initiative to investigate how such funding could be generated, including looking at models such as Larimer County's Open Space Tax or the State of Colorado's GOCO fund, and others (Poudre Runs Through It 2014).

1.6.2.3 Poudre River Forum

The Poudre Runs Through has established an annual Poudre River Forum to bring together all the communities that benefit from the Poudre to celebrate and cooperate. The forum features presentations and panels, think-tank topics, and other educational and entertainment activities. The purpose of the forum is to convene diverse stakeholders and community to collaborate on meeting the dual goals of working river/healthy river (Poudre Runs Through It 2014).

1.6.3 City of Fort Collins Natural Resources Projects

The City of Fort Collins has performed land use and environmental planning for the Poudre River corridor for many years. Among the planning documents available are the Framework for Environmental Action in 1992, Cache la Poudre River Master Plans, and Natural Areas Management Plans in 2001 and 2011. A summary of these documents can be found in the Poudre River Downtown Master Plan (Fort Collins 2014a). The more recent planning and analysis documents developed by the City as they pertain to the Poudre River are summarized below. Additionally, one more recent project completed by the City, the McMurray Natural Area Restoration Project, is described.

1.6.3.1 Poudre River Downtown Master Plan

The City of Fort Collins Poudre River Downtown Master Plan envisions nearly three miles of sustainable river corridor (Shields Street to Mulberry Street) that provides habitat, recreation, and flood mitigation benefits. The plan is a long-term plan consisting of numerous elements that will take many years to complete. The plan integrates improvements to support many high-quality and safe recreational experiences, better protection against flood damage, and restored habitat connectivity for optimal river health and resiliency. Physical improvements which support sustainable use of the river corridor by the community will allow people to continue to enjoy the Poudre River, but in a way that supports a functioning ecosystem by providing connected habitat for fish, terrestrial wildlife, trees and plants, while also enhancing protection of the community during floods (Fort Collins 2014a).

1.6.3.2 Natural Areas Master Plan

Also in July 2014, the City of Fort Collins Natural Areas Department released a Natural Areas Master Plan for public review. The City of Fort Collins has conserved several natural areas along the Poudre River within and outside of the Fort Collins city limits, with properties ranging in size from 1 acre to more than 22,000 acres. Among the principles identified in the document is to maintain the Department's core focus on biologically significant lands, or lands that have the potential to contribute to biological integrity and richness, and to acquire water in order to enhance and sustain habitat, link it to appropriate lands (such as productive farmland), and to satisfy administrative obligations. Lands along the Poudre River, Bellvue area, and adjoining foothills have been identified as priority areas for conservation. Conservation goals of the Poudre River corridor include sustaining and improving water flows, implementing restoration projects that connect the river to its floodplain, creating rich wildlife habitat, improving aesthetics, and providing appropriate recreational activities (Fort Collins 2014b).

1.6.3.3 Ecosystem Response Model

In 2011, the City of Fort Collins initiated the Ecosystem Response Model to help in understanding Poudre River ecosystems from Overland Trail Road to Interstate 25. The

Ecosystem Response Model project has two overarching goals: to quantitatively inform a flow management scenario that most closely helps the community vision of a healthy river, and to provide a coarse-scale evaluation of future river conditions to help provide a glimpse into potential future river conditions. The model contains a network of hydrologic and non-hydrologic drivers that are related to ecosystem functions and river conditions, expressed with a probability of influence (Fort Collins 2014c).

The Ecosystem Response Model and associated documentation were recently released (Fort Collins 2014e). Although an exhaustive review of the model and results were not performed by Northern Water as part of this mitigation plan, the City of Fort Collins did make a presentation of the model to Northern Water staff, and staff has reviewed the model results in general. While Northern Water has concerns with certain aspects of this model and its utility, information from the report was used to inform the development of some aspects of this mitigation plan.

1.6.3.4 McMurry Natural Area Restoration Project

In 2013, the City of Fort Collins began construction of the McMurry Natural Area Restoration Project. The purpose of this project was to lower river banks to reconnect the river to its floodplain, promote native cottonwood forests, create a variety of wetland habitats in the east pond, and enhance recreation with safe access to ponds, the river, and improved trails. The project physically lowered the riverbank to permit higher flows to safely spill onto adjacent low-lying areas within the natural areas. Additionally, the Josh Ames diversion structure was removed in order to permit fish passage, reduce downstream “dry-up”, and improve river based recreation (Fort Collins 2014d). The Josh Ames Ditch water rights were transferred to the City of Fort Collins many years ago and delivered at an alternate point of diversion, thus the ditch had already been abandoned.

1.6.4 Poudre River Trail

The Poudre River Trail Corridor, Inc. is a local non-profit organization that has managed a cooperative effort with the City of Greeley, the Town of Windsor, and Weld County to develop the Poudre River Trail. The Poudre River Trail is 21 miles of a well maintained paved pathway for walking, cycling, running, roller-blading and more. The trail extends from Island Grove Regional Park in Greeley to Colorado Highway 392 in Windsor where it connects to the paved trail in Larimer County's River Bluff's Open Space. The Poudre River Trail Corridor Board was created by the City of Greeley, Weld County, and the Town of Windsor via an intergovernmental agreement, and incorporated to its current form in January of 1997. Funding is raised through grants from Great Outdoors Colorado, Colorado State Trails, and North Front Range MPO, with matching contributions from local foundations, businesses, individuals and governments. The Trail Board continues to oversee maintenance and additional development (Poudre River Trail 2014).

In 2007, the Town of Windsor completed a Parks, Recreation, Trails and Open Lands Master Plan Update (Windsor 2007). The Parks, Recreation, Trails and Open Lands Master Plan is a planning guide that discusses community resources, recreation goals and policies, needs concerning parks, recreation, cultural affairs and museums, open lands, and trails, and strategies and action steps for implementing the plan. The plan identifies the Poudre River Corridor as a key area for land protection, preservation, greenway trails, natural areas, and river access for recreational activities (including fishing, kayaks, and other small watercraft). Windsor plans on completing an update to the Master Plan in 2015 (Windsor 2014).

SECTION 2. MITIGATION GOALS AND OBJECTIVES

This section provides an overview of effects for the key environmental resources affected by NISP, and a summary of mitigation approaches that were identified by Northern Water. Effects are a broad summary of major effects summarized from the SDEIS and associated Technical Reports prepared by the resource specialists, and cited as such, as they relate to mitigation plan development. This section does not identify any new effects. A full description of effects is contained in the SDEIS documents, and the SDEIS documents control over any discrepancies in the description of effects between the SDEIS documents and this document.

2.1 Aquatic Life

Alternative 2 is anticipated to have minor adverse to moderate beneficial impacts on the Poudre River when compared with current conditions. Adverse effects are due to the reduction in flow that occurs with all alternatives downstream of the points-of-diversion for the alternative. Alternative 2 has moderate beneficial effect due to its low flow augmentation program. Effects on the South Platte are negligible; thus, fish and aquatic life mitigation focuses on the Poudre River.

2.1.1 Summary of Effects

In Segment A, NISP would have a minor effect primarily due to reductions in habitat availability for brown and rainbow trout during future spring runoff conditions. In Segment B, NISP would have a minor to moderate beneficial impact on aquatic biological resources mainly due to low flow augmentation releases (section 3.2.4) in winter, early spring, and in September. Flows would enter the river mid-way through Segment A, and remain in the river through nearly the end of Segment B (through Fort Collins). Habitat for nearly all fish species would benefit from the augmented flows. In Segment C, there would be a moderate adverse effect to larger bodied fish due to lower habitat availability with lower spring flows. This adverse effect would primarily apply to suckers, as brown and rainbow trout do not maintain resident, reproducing populations in Segment C. Smaller body fish may benefit due to greater habitat availability at the lower spring runoff flows.

In Segment D, NISP would have minor beneficial (future conditions hydrology) to minor adverse effects (existing conditions hydrology) due to extension of the low flow period into June resulting in changes in habitat availability that benefit some species and are detrimental to others. Effects in Segments E and F would be minor adverse (existing conditions hydrology) to negligible (future conditions hydrology), again due to changes in habitat availability resulting from longer low flow periods.

The creation of Glade Reservoir would represent a major beneficial effect for aquatic organisms. The reservoir would provide new habitat to sustain populations of a variety of

organisms. The reservoir would also be suitable for the establishment and management of a recreational fishery that could support populations of both stocked and self-sustaining fish species. (GEI 2015a).

Northern Water will work with Colorado Parks and Wildlife during the State Fish and Wildlife Mitigation Plan process to develop additional details on aquatic life mitigation.

2.1.2 Mitigation Approach

Mitigating aquatic resource effects can take the form of both flow-related mitigation and in-stream aquatic habitat improvements. Typically, aquatic resource mitigation efforts that address low flow conditions would be more beneficial than high flow periods (both enhancement of low-flow and low-flow channel improvements).

Glade Reservoir provides an opportunity for low-flow aquatic resources mitigation. Because of its proximity to the Poudre River, and ability to make releases back to the Poudre River upstream of all of the affected segments, low-flow augmentation releases would mitigate effects and improve habitat for aquatic life. Glade Reservoir would also provide new habitat for a variety of aquatic organisms, and provide a recreational fishery that could support both stocked and self-sustaining fish species.

Fragmentation of the river into isolated sections with diversion dam structures (there are at least 22 diversions along the mainstem) and culverts is common and can prevent upstream seasonal or spawning movements of fish, which have effects on fish populations. Additionally, channelization (straightening and narrowing) reduces species richness and abundance in warmwater streams and reduces the availability and quality of trout habitat (GEI 2013). Modification of diversion structures to allow fish migration and enhance channel characteristics would not only to benefit aquatic resources (primarily through increased habitat availability), but would also to address geomorphic effects, other environmental resource effects, and convey low flow releases.

2.2 Recreation

Water and land-based recreation would be affected by the construction and operation of NISP facilities. Land-based recreation includes adverse effects to public land access adjacent to NISP facilities. Water-based recreation includes adverse effects on river-based recreation, including fishing, rafting, kayaking, tubing, trails and other river-based boating. Approaches to mitigate recreation effects are summarized in this section.

2.2.1 Summary of Effects

Land-based recreation effects primarily occur due to the construction of Glade Reservoir, and the construction of the SPWCP forebay. Glade Reservoir would cause minor adverse effects due to the loss of access to Poudre River State Trust land which is managed for hunting and fishing by CPW, and land used by the Poudre School District for educational

purposes. However, Glade Reservoir may improve habitat, and therefore improve overall hunting opportunities. The construction of the SPWCP forebay reservoir and pump station would impact facilities at the Mitani-Tokuyasu State Wildlife Area, which is popular for hunting and trapping.

River-based recreation would be affected by changes in Poudre River streamflow downstream of the Poudre Valley Canal. The low-flow augmentation program would result in a minor beneficial effect on recreational fishing in Segments A and B. Reductions in brown trout and rainbow trout habitat would have a minor adverse effect on fishing in Segment A. Reduced streamflow during the summer would result in a minor to moderate adverse effect on river-based boating in Segment B as the number of days that flows exceed the 150 cfs flow target used in the recreation analysis is reduced by approximately 18 days per year on average. NISP would not affect streamflow upstream of the Poudre Valley Canal in reaches popular for commercial rafting trips.

2.2.2 Mitigation Approach

Both Glade Reservoir and the SPWCP forebay provide opportunities to mitigate recreation effects. Management of recreation at Glade Reservoir similar to nearby Horsetooth Reservoir, which is the third most visited reservoir in the state, would provide opportunities for lake fishing, boating, camping, hiking, horseback riding, and biking. Additionally, access to public lands adjacent to Glade Reservoir would be restored, with hunting and recreational opportunities on those lands improved. Annual visitation to Glade Reservoir is estimated to be about 338,600 visits if it were managed for recreation (BBC and HCR 2015). Effects at the Mitani-Tokuyasu State Wildlife Area could be mitigated by reconstructing existing facilities and allowing recreation at the proposed forebay reservoir, which may attract waterfowl and small game to the SWA, as the forebay reservoir is anticipated to have open water during most of the winter.

2.3 Riparian Vegetation

The NISP alternatives would indirectly affect riparian vegetation and (off-site) wetlands along the Poudre River through changes in river stage that, in turn, alter alluvial ground water levels and the inundation and trajectory of wetland and riparian resources along the river.

2.3.1 Summary of Effects

NISP is predicted to reduce inundation of wetland and riparian resources along the mainstem by varying degrees. Changes in inundation associated with the operations of NISP would contribute to the well-established trajectory for the riparian plains cottonwood woodlands but are not predicted to have a significant effect or result in a significant change to plains cottonwood woodlands along the Poudre River, or significantly change the established resource trajectory (ERO 2014). NISP would have minor effects on riparian

cottonwood woodlands in Segments C, D and E associated with infrequent short-lived declines below the observed maximum ground water depths during the growing season. A total of 112.5 acres of riparian vegetation would be permanently impacted.

Ground water level declines of 0.5 foot or greater during the growing season are predicted to occur about 17 to 21 percent of the record at the Martinez Park riparian vegetation study site. About 10 acres of potentially sensitive vegetation classes within 100 feet of the banks in Segment B may be affected by declining alluvial ground water levels (ERO 2014).

2.3.2 Mitigation Approach

The primary approach to mitigate effects to riparian resources is to plant native woody riparian vegetation and disturb decadent stands of woody riparian vegetation to compensate for the reduction in disturbance from inundation. Ideally, locations of riparian vegetation enhancement sites will be located near the areas that are most sensitive to reduction in inundation.

Riparian vegetation enhancement sites should be sited on lands that already have natural resources protection, or on lands on which some type of protection can be obtained, until the planted specimens have matured to prevent damage from grazing mammals. These sites also require that adequate groundwater depths be maintained during the growing season. Therefore, proposed sites would be combined with other channel improvement mitigation measures that would maintain alluvial groundwater levels, including those that mitigate geomorphology and aquatic habitat.

Other mitigation may include control of smooth brome and reed canary grass and nonnative woody vegetation. It is expected that the sites where native vegetation is planted or where other channel enhancements are implemented would provide an opportunity for control of non-native grasses.

2.4 Special Status Species

Special status species include Federal and State listed threatened, endangered, and candidate species and Colorado Natural Heritage Program listed species. The black-footed ferret, Preble's meadow jumping mouse, Colorado butterfly plant and Ute Ladies'-tresses orchid are the only federally listed species potentially occurring in the study areas. There are many state listed species occurring within the study area.

2.4.1 Summary of Effects

Effects on Federally listed species were previous described in Section 1.4.2.

During construction of Glade Reservoir facilities, pipeline construction could take place within 0.5 miles of a bald eagle nest. Construction of the reservoirs would permanently impact upland habitat for the black-tailed prairie dog, burrowing owl, and swift fox.

Impacts to wetland and aquatic habitat would affect habitat for the common gartersnake and northern leopard frog. Changes in Poudre River streamflow could reduce habitat in localized areas for the common gartersnake, northern leopard frog, smokey-eyed brown butterfly, two-spotted skipper and American currant, although habitat would generally remain abundant along the Poudre River and no change in species composition or distribution is expected. Construction of pipelines and other conveyance facilities could affect Bell's twinpod.

2.4.2 Mitigation Approach

Compensatory mitigation will be developed for loss of Preble's habitat at compensatory wetland locations below Glade Reservoir (sections 2.8 and 4.1). These wetland sites could also mitigate habitat loss for the common gartersnake, northern leopard frog, smokey-eyed brown butterfly, two-spotted skipper and American currant. Additional aquatic and riparian habitat improvement projects along the river could benefit these same species.

Final habitat assessments and surveys will be required for the Colorado butterfly plant and Ute ladies'-tresses orchid. Similarly, additional surveys may be required for State listed species if suitable habitat is encountered during construction.

Specific best management practices during construction are proposed for the bald eagle.

2.5 Stream Morphology

In general, operation of NISP is expected to continue and/or accelerate changes in stream morphology that are already occurring. In general, the trajectory of river conditions is reflected in continuing channel contraction, fining of surficial material, and loss of channel complexity. For convenience, geomorphic reaches in the Cache La Poudre River within the study area can generally be divided into reaches that are upstream of I-25 and downstream of I-25, although this boundary is approximate and can vary through time.

2.5.1 Summary of Effects

Upstream of I-25 the river channel is larger and steeper but there is also a strong aggradational tendency associated with reduced flows and the large number of diversion structures that control in-channel hydraulics. Consistent and contiguous aggradation is constrained by a lack of available sediment compared to the sediment transporting capacity of the channel. This reach of the river is characterized as "supply limited" (Anderson Consulting Engineers 2014). Channel change in the existing river condition is generally a consequence of both direct influence in the river (gravel extraction, floodplain encroachment, realignment, channel modification, structures, etc.) and hydrologic change.

Downstream of I-25 the river channel has contracted to as little as 15 feet wide at some riffles. Vegetation (predominantly reed canary grass) colonizes deposited material and ensures the longevity of mid channel bars, bank attached side bars, islands and lee side

deposits. The river in this reach is characterized as "transport limited" (Anderson Consulting Engineers 2014). River morphology continues to respond to changes in hydrology associated with water resources development and direct interference with the river channel through channel modification associated with gravel extraction, urban development and structures.

Operation of NISP is expected to continue the acceleration and amplification of the current trajectory of change, with the greatest effects generally downstream of I-25, including continuing channel contraction anchored by non-native vegetation encroachment, fining of surficial material, and loss of channel complexity. Floods and high flows would occasionally disrupt the channel contraction trend, stripping vegetation and mobilizing bed material, however, wholesale removal of vegetation is unlikely during these events. Upstream of I-25, some areas of channel instability, deposition and vegetation encroachment would continue to occur. Effects on geomorphology and sediment transport may result in detectable change that would be considered minor upstream of I-25, and would likely result in a detectable change that is considered to be moderate downstream of I-25 (Anderson Consulting Engineers 2014, Corps 2015).

Flooding events of the magnitude that occurred in September 2013 will continue to occur within the Poudre River watershed with or without NISP alternatives. NISP alternatives would have little impact on similar large events, as the reduction in peak discharge associated with the NISP alternatives does not reduce the magnitude to an extent that would alter the predicted impacts (Anderson Consulting Engineers 2014).

2.5.2 Mitigation Approach

The primary geomorphic mitigation approach is mitigation of direct influences on the river. Upstream of I-25, implementation of channel enhancements would not only have geomorphic benefits, but also benefit aquatic species, water quality, and riparian vegetation. Downstream of I-25, channel improvements would primarily benefit geomorphology, and have secondary benefits to aquatic species and riparian vegetation. Throughout the reach, influencing the trajectory of riparian vegetation growth, primarily canary reed grass, could have benefits to geomorphic processes as well.

2.6 Terrestrial Wildlife

Terrestrial wildlife would be affected by the construction of NISP facilities. Temporary disturbances would occur during the construction process, while permanent effects would result primarily from the inundation of land by reservoirs, and by the U.S. Highway 287 realignment. Temporary disturbances would be mitigated by best management practices during and following construction. This section summarizes permanent effects and opportunities to mitigate the permanent effects, with information primarily derived from the Wildlife Resources Technical Report and Supplement (ERO 2008a; ERO 2015a).

2.6.1 Summary of Effects

Construction of the proposed Glade Reservoir and the U.S. 287 realignment would result in the loss of overall habitat for elk, mule deer, white-tailed deer, and pronghorn, and winter habitat for mule deer. Although eastward movement of deer and elk in this area is currently limited by U.S. 287 and the Holcim Mine, inundation of this portion of U.S. 287 would likely disrupt traditional east-west movement of deer and elk across the highway, displacing movement to the north and/or south of the proposed Glade Reservoir. Such a shift in current big game movement patterns could result in more frequent crossings in more concentrated areas, exacerbating the risks of deer or elk collisions with vehicles. Glade Reservoir would also block the current hunter access to State Trust lands and the national forest west of the proposed reservoir site.

Bird species would be affected by the loss of nesting, migratory, winter, and year-round habitat, and the potential destruction of nests. Construction of Glade Reservoir and the U.S. 287 realignment would result in the loss of grasslands, shrublands, wetlands, and open water and stream habitat. Raptors requiring large trees for nesting could also be affected in riparian areas supporting large cottonwoods.

Construction of the proposed Galeton Reservoir would result in the loss of mule deer and pronghorn overall habitat. Overall ranges for all of these species and mule deer and white-tailed deer concentration areas are relatively widespread in the affected game management units, although more fragmented where development has occurred. Galeton Reservoir would result in the permanent loss of grassland habitat, including upland native grasslands, which would primarily impact ground-nesting and other species associated with native grassland habitats.

The SPWCP forebay would result in the permanent loss of mule deer severe winter range, and agricultural land that potentially supports waterfowl, songbirds, raptors, reptiles, amphibians, and other wildlife. Construction of the SPWCP facilities at the diversion and forebay may also affect public use of the Mitani-Tokuyasu SWA.

At all sites, loss of grassland and shrub and cliff habitat could also affect reptiles, amphibians, and other small mammal species.

2.6.2 Mitigation Approach

Overall ranges for most game, avian, reptile, amphibian and small mammal species and concentration areas for all these species are relatively widespread in the affected areas, although more fragmented where development has occurred. Therefore, no specific mitigation is proposed for the loss of this habitat. However, mitigation opportunities identified for other environmental resources, including riparian vegetation and wetlands, on-site wetlands, and Preble's meadow jumping mouse would provide secondary benefits

to affected wildlife resources. Additionally, all alternatives require compliance with the Migratory Bird Treaty Act and other federal and state regulations.

All of the action alternatives would result in impacts to antelope habitat as a result of construction of Galeton Reservoir, and impacts to deer from construction of the SPWCP forebay and diversion. Potential measures for compensating these impacts could include enhancing antelope and deer habitat at off-site areas or preserving antelope (grassland) and deer (riparian) habitat through land purchases or conservation easements.

For U.S. Highway 287 realignment, options are available to provide mitigation measures in the highway design to influence the east-west movement of deer and elk species in the area, including minimizing vehicle-wildlife collisions in this area. These opportunities would primarily include fencing and warning signs along, and crossing structures beneath, the new highway.

Public access to existing state and federal lands, and wildlife areas, would be affected at the Glade Reservoir and SPWCP diversion and forebay site. Designs for these facilities would include continued access to these lands, and compensation for loss of land or use.

Northern Water will work with Colorado Parks and Wildlife during the State Fish and Wildlife Mitigation Plan process to develop additional details on terrestrial wildlife mitigation.

2.7 Water Quality

Reductions in streamflow resulting from NISP diversions at the Poudre Valley Canal could have effects on water temperature and certain water quality parameters. Although the diversions themselves do not result in increased temperature or the introduction of water quality pollutants into the Poudre River, lower streamflow can result in acceleration of the physical processes that lead to water warming, and provide less “dilution” flow for pollutants that are contributed from other parts of the watershed.

For regulatory purposes, the Colorado Water Quality Control Division divides the Poudre River within the NISP study area into three segments. Segment 10 is from the Poudre Valley Canal to Shields Street, and the use designations are classified as Aquatic Life Cold-2 (with the 2 indicating the abundance of aquatic species may be below expectations), Recreation E (Existing Primary Contact Use), Water Supply and Agriculture. This segment is on the 303(d) impairment list for copper and temperature. Segments 11 and 12 are downstream of Shields Street, and use designations are classified as Aquatic Life Warm-2, Recreation E, and Agriculture. These segments are on the 303(d) impairment list for selenium and *E. coli* (downstream of Boxelder Creek). The South Platte portion of the study area is entirely within Segment 1b, in which use designations are classified as

Aquatic Life Warm-2, Recreation E, Water Supply and Agriculture. This segment is on the 303(d) impairment list for selenium.

Water quality effects and mitigation approaches are based on Phase I of the water quality evaluation as described in the SDEIS. Water quality effects and subsequent mitigation approaches and actions will be refined between the SDEIS and FEIS based on results of Phase II water quality modeling.

2.7.1 Summary of Effects

In the coldwater segment (Poudre Valley Canal to Shields Street), NISP could increase the magnitude and frequency of current temperature excursions (values above standards) in July and August, particularly upstream of Hansen Supply Canal inflows. Release of augmentation flows (see section 3.2.4) would benefit current temperature excursions in September and March downstream of the release point if releases are made from the hypolimnion in Glade Reservoir. Dissolved Oxygen is not highly sensitive in this reach and significant effects on DO are not expected.

In the warmwater segment (downstream of Shields Street), NISP could result in warmer temperatures due to warmer inflows from upstream reaches. Downstream of the New Cache diversion and in the South Platte, effects are expected to be minimal. There are some reaches upstream of the New Cache diversion, in particular from the Fossil Creek Inlet to Boxelder Creek, which could experience adverse temperature effects in July and August. Similarly, dissolved oxygen issues could be exacerbated in this same reach and during the same time.

The temperature of water entering the South Platte from the Poudre River is not expected to change substantially. Thus, there is no expected increase in temperature excursions on the South Platte.

For other water quality pollutants, the primary effects of NISP are decreased dilution flows along the entire river Poudre River during diversions under the Grey Mountain water right, and from the Poudre Valley Canal to the New Cache diversion structure during operation of the SPWCP exchanges. Diversions under the Grey Mountain right typically occur from May through mid-July during high runoff conditions, at a time when dilution flows are typically not of concern. However, in the lower reaches of the river, particularly downstream of the Eaton Draw confluence, there are elevated levels of nitrogen that can occur throughout the year. This increase is likely due to both point and non-point sources in Eaton Draw and groundwater. Exercise of the Grey Mountain right could exacerbate these elevated levels.

Reduced flows from SPWCP exchanges could exacerbate high levels of selenium, iron and manganese that occur in mid-river and lower-reaches, particularly downstream of the Fossil Creek Inlet and Boxelder Creek. Selenium levels are naturally high within the Poudre

Basin, and become particularly elevated in some tributary streams (such as Boxelder Creek) and in groundwater that conveys natural runoff and irrigation return flows from areas that are underlain by the selenium-producing Pierre shale. Higher levels of dissolved iron may be a result of mobilization of bottom sediment during releases from Fossil Creek Reservoir. Additionally, the numerous gravel pits that are hydraulically connected to groundwater (i.e. unlined gravel pits) may affect water quality in the Poudre River, as anoxic conditions that develop in these pits may result in releases of metals (primarily iron and manganese) from sediments and transport of these metals through groundwater seepage to the adjacent stream segments.

Although current levels of other parameters such as chloride, copper, and sulfates are generally considerably below standards, reduced streamflow could cause increased concentrations, particularly during low-flow periods.

2.7.2 Mitigation Approach

NISP effects on temperature are due to decreases in streamflow caused by diversions from the river during low-flow periods and higher water temperatures upstream of the Canyon gage. These are attributable to a shallower water depth and an increased rate of warming below the Poudre Valley Canal diversion. Effects are not caused by a release of warm water back into the river. Although temperature modeling has not yet been performed, the Phase I water quality analysis indicates that effects on stream temperature from NISP diversions are likely small (i.e. less than a few degrees C), and effects on temperature that approach the standards are generally confined to approximately 2 miles of the river between the Poudre Valley Canal diversion and the Hansen Supply Canal discharge, where cooler water is released to the river during most days during dry periods. Operational and structural mitigation opportunities, both upstream of and within this reach, were considered to address these temperature effects.

Opportunities may exist to enhance channel and riparian area characteristics within and upstream of critical reaches to reduce in-channel water temperatures. For example, the San Joaquin River Restoration Program has investigated options to reduce in-channel water temperature through several means, including channel restoration to provide a low-flow channel that increases water depth, and enhancement of riparian areas adjacent to these reaches to provide additional shading. Initial modeling showed potential to reduce temperatures by 1.5 – 3.0 ^{o}F during the hottest part of the year with heavy riparian cover, and 3 – 8 ^{o}F during the hottest part of the year through channel modification (San Joaquin 2008). The program is continuing to collect data and refine modeling to validate the initial results (San Joaquin 2014). However, temperature reductions at even the lowest of the ranges calculated for these types of restorative efforts would provide opportunities to mitigate and improve in-channel temperatures in critical reaches of the Poudre.

For remaining water quality pollutants, mitigation opportunities can generally be classified as either adjustments to project operations that are designed to avoid impacts by releasing water that is similar in water quality to that in the river, or source control of pollutants in the watershed before they reach the river. Because many pollutants are either naturally occurring due to geologic conditions or are non-point source pollutants that require broader watershed-level efforts, opportunities for source control of pollutants to mitigate NISP effects are somewhat limited. However, Northern Water has analyzed opportunities for point source control through constructed wetlands, which use "natural processes involving wetland vegetation, soils and their associated microbial assemblages to improve water quality" and have been used as such for many years (EPA 2004).

Operational adjustments may be possible to avoid potential impacts from NISP, and to improve existing conditions. Operational adjustments considered for mitigation include curtailment of NISP diversions and exchanges when certain water quality thresholds are met (using real-time data where appropriate), releases of water from storage during key times, and other operational considerations. Because many of the water quality effects are coupled with low-flow issues, mitigation opportunities that seek to address low-flow issues may also serve as an opportunity to address water quality issues.

All proposed water quality mitigation measures will require expansion of the existing water quality monitoring network in the Poudre River, including the installation and operation of real-time water quality monitoring sites at key locations. To the extent possible, these sites would be coupled with additional streamflow monitoring sites that will be required to monitor flow-related commitments identified throughout this plan.

Detailed water quality modeling is currently being performed by an SDEIS third party contractor. Results of the water quality modeling are required to refine and more fully develop the water quality mitigation actions. These refinements will be completed prior to the final mitigation plan included with the FEIS.

2.8 Wetlands and Other Waters

All alternatives would have temporary and permanent effects on wetlands. The Corps regulates the discharge of dredged and fill material into waters of the U.S., including wetlands, under Section 404 of the Clean Water Act (CWA). Wetlands not subject to the Corps' jurisdiction under Section 404 of the CWA are afforded protection under Executive Order 11990, which requires federal agencies to "consider factors relevant to a proposal's effect on the survival and quality of the wetlands" and to avoid, minimize, and mitigate unavoidable impacts on wetlands. Additionally, in compliance with Department of Transportation Order 5660.1A, "Preservation of the Nation's Wetlands" (1978), FHWA requires mitigation for impacts to nonjurisdictional wetlands.

This Conceptual Mitigation Plan focuses on those wetland impacts that are permanent. Temporary impacts to wetlands from pipeline crossings, construction disturbances, and other activities will be restored in place to pre-construction contours, topsoil, vegetation and function.

2.8.1 Summary of Effects

The Glade Reservoir and U.S. 287 study areas contain both riverine (occurring along a river or stream) and depressional (occurring in depressions) wetlands. The riverine wetlands in the Glade Reservoir and U.S. 287 realignment study areas are generally rated moderate to high for general wildlife habitat, sediment/nutrient/toxicant removal, production export/food chain support, and sediment/shoreline stabilization. The depressional wetlands in the Glade Reservoir and U.S. 287 study areas generally rate moderate to high for general wildlife habitat, sediment/ nutrient/toxicant removal, production export/food chain support, and ground water discharge/recharge (ERO 2008b; ERO 2015b).

The Galeton Reservoir study area contains depressional wetlands that generally rate moderate to high for general wildlife habitat, sediment/nutrient/toxicant removal, production export/food chain support, and ground water recharge/discharge (ERO 2008b; ERO 2015b).

Permanent direct impacts to wetlands under Alternative 2 are approximately 45 acres, and consist primarily of impacts to palustrine persistent emergent wetlands at Glade Reservoir (approximately 41.6 acres). The western realignment alternative for U.S. 287 (which is the alignment route included in the SDEIS analysis) would permanently impact about 2.5 acres of low quality wetlands. Galeton Reservoir would permanently impact approximately 0.3 acres of wetlands. The remaining permanent effects are primarily to wetlands at the Glade Reservoir site that are rated high for general wildlife habitat, sediment/shoreline stabilization, sediment nutrient/toxicant removal, production export/food chain support, and ground water discharge/recharge functions. Permanent impacts to wetlands under Alternative 2 are considered major long-term effects (ERO 2008b; ERO 2015b).

2.8.2 Mitigation Approach

As required by federal regulations, any unavoidable permanent impacts on wetlands must be fully compensated. The Wetlands and Other Water Technical Report (ERO 2008b) has identified several on-site opportunities for wetland mitigation at the Glade and Cactus Hill Reservoir sites, and the U.S. Highway 287 realignment site. These options are further discussed in Section 4.1.

SECTION 3. AVOIDANCE, MINIMIZATION AND OTHER COMMITMENTS

Throughout the development of NISP, from the initial NISP concepts through the conceptual designs now being analyzed by the Draft and Supplemental Draft Environmental Impact Statements, Northern Water has incorporated design and operational components that are intended to avoid and minimize environmental effects. These actions are a result of more than 30 years of planning, and reflect the more recent conceptual design and analysis of the NISP alternatives, including analyses performed during the Draft EIS.

This section summarizes avoidance and minimization techniques, including more significant construction-type best management practices (BMPs) that are typically employed on large construction projects; more minor BMPs are not necessarily described herein. A summary table of the Conceptual Mitigation Plan is contained in Appendix A.

3.1 Infrastructure Design

This section provides information on specific design features of NISP infrastructure that are proposed to avoid or minimize environmental effects.

3.1.1 Project Configuration

The NISP and Glade Reservoir concepts have more than a 30-year history of evolution from their original configuration to the configuration currently being proposed. Throughout this evolutionary period, the Project has evolved based on changing public values regarding the environment. Two of the most significant changes in the NISP/Glade Reservoir that avoid environmental effects are the movement of the proposed reservoir from an on-channel reservoir site to an off-channel reservoir site, and the elimination of a potential point-of-diversion that would have been upstream of the North Fork confluence with the Poudre River.

Water development in the Poudre River Basin has been formally studied since the mid-1960's when Reclamation first considered formation of the Poudre Unit. In 1980, the Cache la Poudre Water Users Association filed water rights for a proposed 220,000 acre-foot reservoir located on the Poudre River channel at the Grey Mountain site, approximately 3 miles west of Ted's Place. In 1985, Northern Water acquired a 7/8 share in the conditional water right. Since that time, Northern Water has conducted and participated in many studies for storing unappropriated flows on the Poudre River (MWH 2004), including a basin study conducted with the Colorado Water Resources & Power Development Authority in 1987 (Harza) and extension of that study in 1990 (EBASCO, Harza, et al.). Through these processes, Northern Water determined that an on-channel reservoir was not environmentally or publically acceptable, and moved its

preferred alternative to its current location at Glade Reservoir. Although not studied in detail, this change undeniably avoided and minimized many environmental effects of the originally proposed reservoir. All on-channel reservoirs were eliminated through the NISP screening process.

Another feature of the NISP project that has been informally studied by Northern Water is construction of a new tunnel that would divert water from the Poudre River upstream of the confluence with the North Fork, or diverting water into the reservoir using the existing Munroe Canal, which also diverts water upstream of the confluence with the North Fork. Constructing a diversion tunnel could allow conveyance of diverted streamflow to Glade Reservoir without pumping, while use of the Munroe Canal could reduce pumping during lower reservoir elevations. These options were eliminated due to environmental effects, partially because these options would dewater a reach of the Poudre River that is a popular river recreation area.

3.1.2 Poudre Valley Canal Diversion Structure (AG-04)

As part of project construction, the existing Poudre Valley Canal diversion structure (Figure 1) would be replaced with a similar structure with improvements made for sediment diversion possibilities, fish passage and boater safety. The existing structure consists of a concrete overflow weir in the Poudre River, a headgate structure with three radial gates, a trash rack, and a gated sluiceway back to the river. The existing weir in the river is in poor condition, and the headgate structure leaks (MWH 2004).

Figure 1. Existing Poudre Valley Canal Diversion on Poudre River near Canyon Mouth

The replacement structure would be a similar configuration to the existing structure, with the diversion capacity of the structure increased to approximately 1,700 cfs (1,200 cfs for NISP diversions, and 500 cfs for existing decreed water rights in the Poudre Valley Canal). Conceptual designs of the headgate structure include a diversion structure with four 15-foot wide radial gates, trash rack, and gated sluiceway (MWH 2004). The gates would be configured with vanes and floor elevations that allow selective diversion of bed load and sediment that may be required as part of the geomorphology adaptive management program (section 4.3.5).

The existing diversion weir in the Poudre River would be replaced with a weir that maintains similar upstream water levels as the existing structure, but has been modified as a multi-objective diversion structure. The diversion dam structure would contain fish passage capabilities (see Section 4.3.3 for options being considered for fish passage capabilities). Additionally, design of the diversion dam crest would consider options for improved boater safety at the structure to reduce the possibility of boaters becoming trapped in the "roller" that occurs downstream of the existing ogee crest. One possibility for this design is a grouted rock ramp, similar to those recently installed on the St. Vrain River near Lyons (Figure 2). Although this type of structure is not designed for boat passage, it is designed to reduce injury or death of boaters that may accidently boat over the structure and be trapped in the hydraulic jump on the downstream side of the drop. The new structure would not materially increase the water surface elevation of the pool upstream of the structure, and would enhance aquatic habitat connectivity upstream and downstream of the structure by allowing for fish passage.

Figure 2. Rough and Ready Grouted Boulder Diversion Dam Structure

3.1.3 Glade Reservoir Release Structure (WQ-02)

The Glade Reservoir complex would incorporate two primary means of releasing water back to the Poudre River. Low flow releases would be made through a pipeline connected to a multi-level outlet structure (section 3.2.6) that would convey water back to the Poudre immediately south of the dam, entering the Poudre River just upstream of the Larimer County Canal diversion near Greeley's Bellvue Treatment Plant, approximately 0.5 miles south of Ted's Place. Higher flow releases would be made back through the Poudre Valley Canal, which would release water back into the Poudre River near where the existing Windsor Extension crosses beneath the Poudre River, approximately 1.9 miles west of Ted's Place.

The structures for releasing water from Glade Reservoir to the Poudre River would be designed to aerate the water to increase the dissolved oxygen concentration of the water discharged to the river. The ability to aerate and increase dissolved oxygen through the design of hydraulic structures has been studied and known for quite some time, and study continues on how to better design hydraulic structures to increase dissolved oxygen in water released from dams (Falvey and Ervine 1988; Wahl and Young c1994). The California State Water Resources Control Board provides a list of best management practices to improve dissolved oxygen levels in dam impoundments, tailwaters and/or reservoirs including the use of gated conduits, spillway modifications, reregulation and labyrinth weirs, pumping and injection systems, and selective withdrawal (California 2014). Studies are also on-going that investigate the influence of stepped chute slopes on dissolved oxygen content (Baylar et al. 2009).

Currently, it is expected that both the low flow pipeline release and the high flow canal release would incorporate a chute feature at their outfalls into the Poudre River that contain either baffles or steps to increase dissolved oxygen and dissipate energy to prevent channel erosion. Studies by Baylar et al. (2009) show that "stepped cascade aerators are very efficient at oxygen transfer because of the strong turbulent mixing associated with substantial air bubble entrainment" and the increasing channel slope of the chutes provides better entrainment. A similar type of structure is contained at the terminus of the Hansen Supply Canal as it conveys water from Horsetooth Reservoir and discharges into the Poudre River (Figure 3). It is likely that NISP structures would incorporate increased baffling or steps beyond that designed for the Hansen Supply Canal chute structure.

Figure 3. Hansen Supply Canal Discharge Structure to Poudre River

3.1.4 SPWCP Diversion Design (AG-07)

The SPWCP would divert water from the South Platte River just downstream of its confluence with the Poudre River. The diversion structure from the South Platte would consist of a new diversion dam across the South Platte River and an intake located on the north river bank that. The intake would divert water into a 150-foot long concrete box flume or conduit that would convey water to the forebay reservoir. This water would then be pumped into Galeton Reservoir via a pump station and pipelines.

The new diversion dam across the South Platte River would consist of a fixed concrete weir, weir sections with Obermeyer crest gates at the main river channel, a radial gate section near the north river bank, and short embankment sections at each end of the weir. The Obermeyer crest gates would allow fish migration in the South Platte during most times of the year when the SPWCP is not diverting, or when the flow in the river is high enough that the Obermeyer crest gates do not need to be raised to provide adequate head for diversion. This type of diversion structure has recently been installed for the Beeman Ditch on the South Platte near Platteville (Figure 4), with the specific goal of allowing fish passage during most months during the year. The SPWCP diversion structure would only nominally increase upstream water depth, and the pool would be contained entirely within the existing channel and would not affect wetlands.

Figure 4. Newly Installed Beeman Ditch Diversion Structure Using Obermeyer Crest Gates on South Platte near Platteville With Gates in Up Position

Without avoidance actions, the diversion could entrain fish from the river and affect the South Platte fish community. However, Northern Water has committed to work with CPW to design and operate the diversion to minimize or avoid fish entrainment. The most common type of practice to reduce fish entrainment at diversion structures is a positive barrier fish screen which essentially consists of a screening mesh that is sized to prevent entrainment of the target fish species while still allowing adequate flow capacity through the structure. These structures are highly effective, but need to have regular maintenance to clean trash, debris and sediment from the screens (Reclamation 2006).

Behavioral methods have also been studied and implemented on some structures. Behavioral methods may include louvers to create turbulence, startle-response techniques such as lights (strobes), sound, and electrical fields. However, these types of techniques have typically had considerably less than 100 percent fish exclusion efficiency (Reclamation 2006).

Ultimately, techniques will be incorporated into the diversion structure in coordination with CPW during final project design. The specific techniques depend on several factors that will not be known with certainty until the design commences.

3.1.5 Visual Impact Mitigation (VS-01)

Both Glade and Galeton dams and reservoirs would alter views from some locations in the project area. Northern Water would implement the following mitigation measures to

minimize the contrasts and decrease the visibility between the proposed dams and the observation points:

- Revegetate all disturbed areas by seeding and/or planting with native plant species existing at this site. Prior to construction, develop a landscape planting plan to effectively select and locate proposed plant materials to enhance or screen views of the reservoir and/or dam.
- Shape cut slope faces to blend with adjacent undisturbed rock faces. Connect new fills associated with the dam to adjacent undisturbed slopes by developing similar landforms and drainage patterns.
- Plant native tree and shrub species in selected locations to obscure views of the proposed dam from the most visually affected observation points.

3.2 Project Operations

This section provides information on operational commitments that Northern Water has made for NISP through various mechanisms, including water rights decrees and this Conceptual Mitigation Plan, that are proposed to avoid or minimize environmental effects.

For flow commitments described in this section and in section 4.3, Northern Water is making these commitments to mitigate and benefit the environment. Northern Water is working to ensure that all flow commitments described herein are protected from a water rights perspective so that bypassed or released flows remain in the river through the reaches described in this mitigation plan. If during actual operations, administration of water rights on the river results in the flow commitments not reaching the targeted flows or reaches (i.e. operations by others result in the bypassed or released flows not remaining in the river through the intended reach), Northern Water would cease operation of the flow commitment and seek administrative and legal solutions to ensure that these operations would result in the intended flows being met. Section 3.2.5 contains additional information on measures already being undertaken to protect these flows.

3.2.1 Avoid Munroe Canal Diversions (FW-01)

The original Draft EIS considered using the Munroe Canal for two operations associated with NISP. First, it was proposed that during certain situations, the Munroe Canal would serve as a secondary diversion from the Poudre River to fill Glade Reservoir. Second, it was proposed that deliveries could be made from Glade Reservoir to the Pleasant Valley Pipeline via the Munroe Canal to Participants that are delivered treated water from the Soldier Canyon Filter Plant. This exchange would have reduced flow in the Poudre River from the Munroe Canal diversion to the Glade Reservoir release point.

Based on comments received on the Draft EIS, Northern Water is no longer proposing either of these operations, and their effects are not included in the SDEIS. The exchange has been eliminated in the SDEIS analysis, and replaced with a new pipeline directly from Glade Reservoir to the Pleasant Valley Pipeline (for Fort Collins-Loveland Water District) and a new pipeline directly from Glade Reservoir to the Soldier Canyon Filter Plant (for Eaton, Severance and Windsor). This avoids streamflow depletions in Poudre River streamflow between the Munroe Canal diversion and the Glade Reservoir release point.

3.2.2 Curtail Diversions for Non-Consumptive Water Rights (FW-02)

Northern Water would make diversions to NISP under its Grey Mountain storage right and under storage and exchange rights associated with the SPWCP. There are currently three water rights decreed on the Poudre River for non-consumptive purposes: the Watson Lake Fish Hatchery water right, Fort Collins Boat Chute water right, and the Fort Collins Nature Center water right (Figure 5).

Based on its water right priority, exchange rights for the SPWCP are junior to these three non-consumptive water rights. Additionally, through water rights stipulations, although the Grey Mountain water right is senior to all three non-consumptive water rights, Northern Water has agreed to curtail in-priority NISP diversions under the Grey Mountain storage right to the extent that these curtailments would help satisfy the Watson Lake Fish Hatchery and Fort Collins Boat Chute water rights (Table 3).

Further description and simulation of these curtailments is contained in the NISP Operations Plan Report (CDM Smith 2014a).

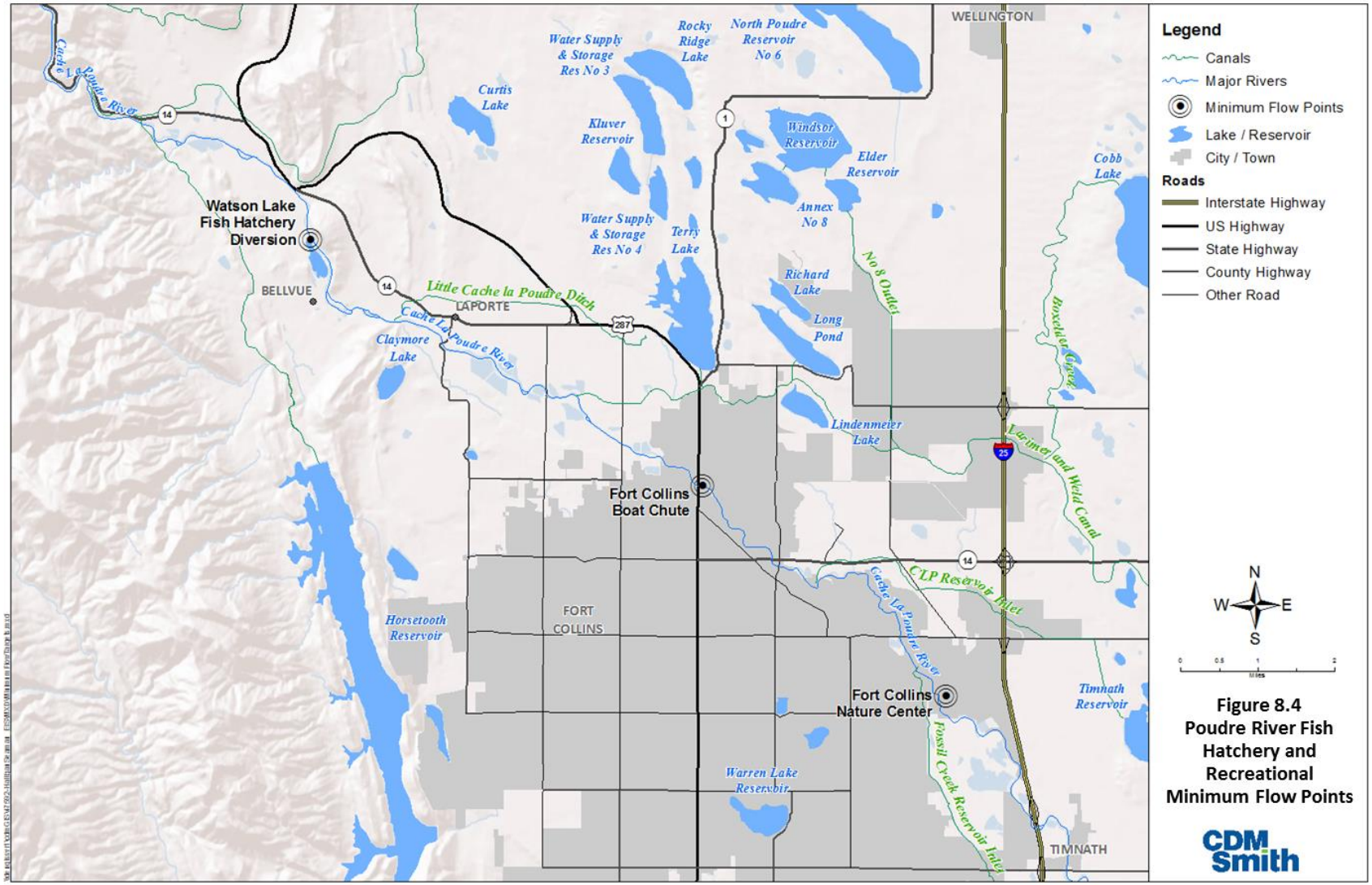

Figure 5. Poudre River Fish Hatchery and Recreational Minimum Flow Points (CDM Smith 2014a)

Table 3. Decreed and Stipulated Flow Commitments by NISP for Non-Consumptive Water Rights

Water Right	NISP Flow Commitment (Summer/Winter, cfs)	
	Grey Mountain Water Right [1]	SPWCP Water Rights [2]
Watson Lake Fish Hatchery [3]	50/25 (Apr 15-Oct 14 / Oct 15-Apr 14)	50/25 (Apr 15-Oct 14 / Oct 15-Apr 14)
Fort Collins Boat Chute		30/5 [4] (May 1-Aug 31 / Sep 1-Apr 30)
Fort Collins Nature Center	50/25 [5] (Apr 15-Oct 14 / Oct 15-Apr 14)	50/25 [5] (Apr 15-Oct 14 / Oct 15-Apr 14)

[1] As decreed in 80CW355 and stipulated in Consolidated Case Nos. 85CW206, 85CW207, 85CW208, 85CW209, 85CW210, and 89CW122.

[2] As decreed in 92CW130.

[3] As measured immediately upstream of the Watson Lake Fish Hatchery diversion.

[4] All river flows between 5 cfs and 25 cfs to be shared equally between Fort Collins and the City of Thornton, and Fort Collins is entitled to no more than 15 cfs (September 1 - April 30).

[5] Fort Collins Nature Center flow requirements to be measured at the Boxelder gage, and requires that the Fossil Creek inlet is operated according to Fossil Creek low flow operational procedures (see SDEIS for additional information).

3.2.3 Summer and Winter Diversion Curtailments (FW-03)

To help maintain a base flow in the Poudre River to improve ecological and aquatic functions, Northern Water would curtail NISP water rights operations on the Poudre River as follows:

- Grey Mountain water right – Diversions would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River below the Poudre Valley Canal.
- SPWCP water right – Exchanges would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River between the Poudre Valley Canal and the New Cache diversion.

The flow commitments would be made provided Northern Water can be assured that the passed water would flow through the reaches described and not be diverted by junior appropriators. Additional gaging stations that Northern Water commits to installing as part of this commitment are described in section 4.4.3.

3.2.4 Low Flow Augmentation Release (FW-04)

To further improve the cold water fishery on the Poudre River from the canyon mouth through Fort Collins, Northern Water would integrate a flow augmentation program that would release water from Glade Reservoir to improve Poudre River streamflow from the

canyon mouth through Fort Collins. The following provides information on the low flow augmentation release program:

Target Flow: Water would be released from Glade Reservoir as necessary to maintain a flow of 10 cfs at the target measurement location subject to the volumetric limitation described below. This flow, adjusted for transit losses assessed by the division engineer, would remain in the river through the target flow reach.

Target Measurement Location: downstream side of the Larimer Weld Canal headgate. This location was selected for monitoring the target flow because (a) it is administered as a dry-up point during the winter, and (b) it is upstream of the Martinez Park reach of the Poudre River, which is a critical site for several other resource analyses (e.g., aquatic habitat, water quality, and geomorphology).

Target Flow Reach: Northern Water would release water from Glade Reservoir via a pipeline to the river upstream of the Larimer County Canal headgate. The exact location of the release would be determined in the final mitigation plan. Northern Water would recapture releases downstream of Fort Collins. The most upstream point of capture would be the Timnath Reservoir inlet canal headgate, about 12 miles downstream, just upstream of where the Poudre crosses Prospect Road (Figure 6).

Time Period: Releases would be made November 1 through April 30, and September 1 through September 30. Real-time monitoring of the augmentation pool and streamflow may allow releases on additional days outside of this designated period.

Volumetric Limit: A pool of 3,600 AF would be designated in Glade Reservoir at the start of each irrigation year. Any unused volume of water would not be carried over to subsequent years and would revert to NISP supply available for delivery to the project Participants.

Restrictions: Streamflow augmentation releases may be required under extreme drought conditions when Glade Reservoir storage contents are less than 30 percent of capacity. Hydrologic modeling performed for the SDEIS shows that in the 56-year simulation period, this would have occurred for three months in 1957, and in 2005 (Figure 7). Any curtailment would be planned and coordinated with CPW well in advance of the curtailment to maximize benefits of the water available for release. Further details regarding curtailment of streamflow augmentation releases during extreme drought conditions will be discussed with CPW during development of the final mitigation plan.

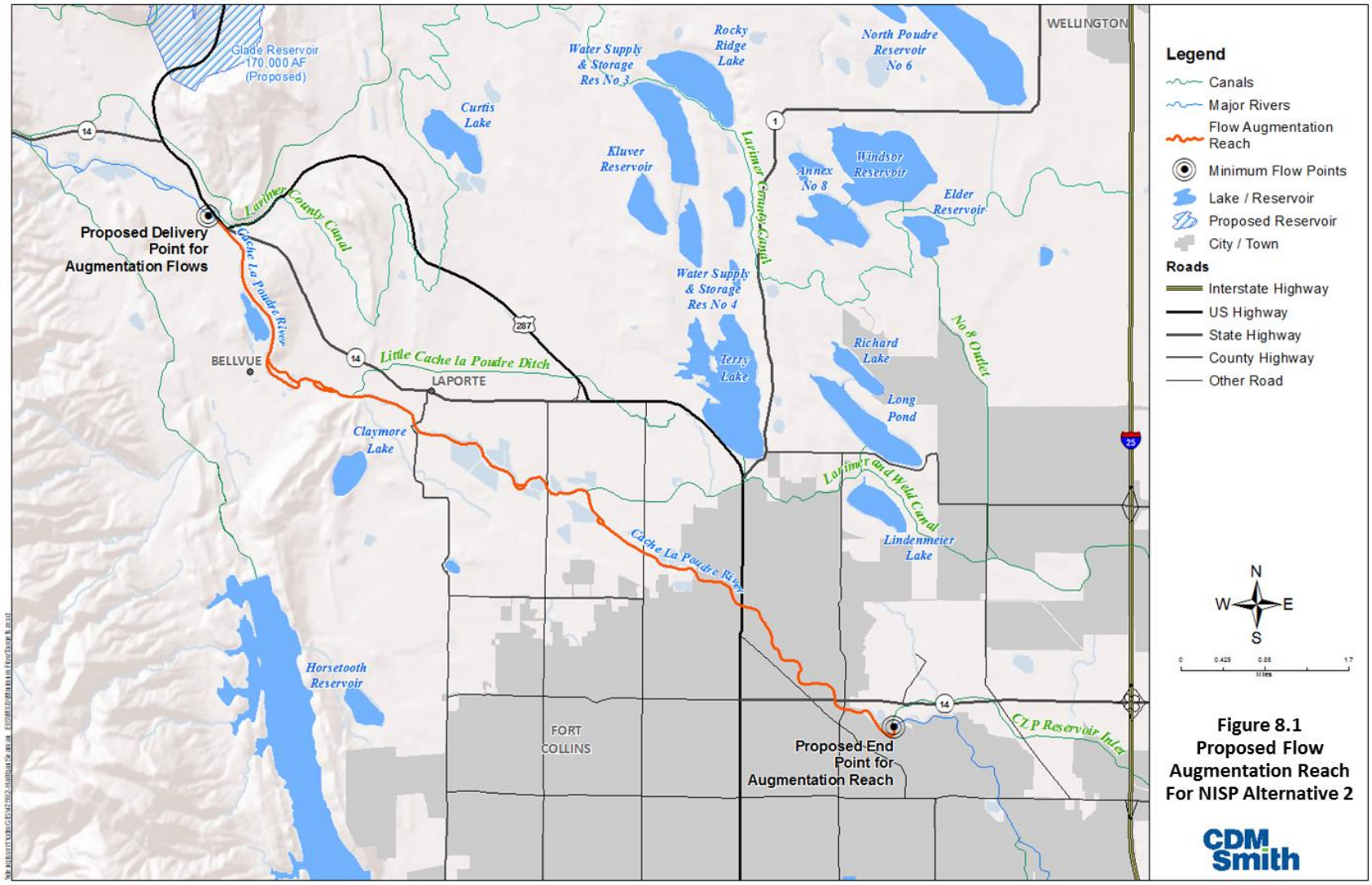

Figure 6. Flow Augmentation Release Reach (CDM Smith 2014a)

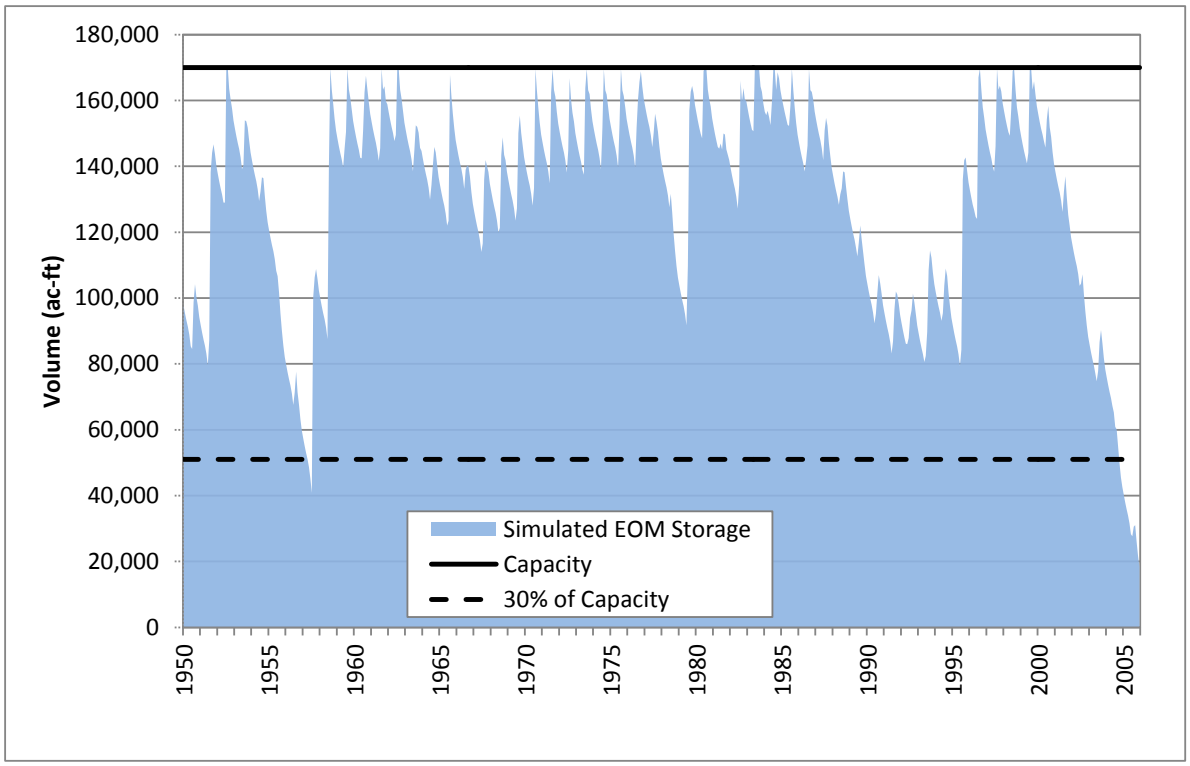

Figure 7. Simulated Glade Reservoir End-of-Month Contents, Run 3a, Without Contract

The delivery of low flow augmentation releases by NISP to the Poudre River was simulated in the hydrologic modeling performed for the EIS (CDM Smith 2014a). Figure 8 presents a summary of simulated streamflow at the Lincoln Street gage (downtown Fort Collins) using current conditions hydrology from the Water Resources Technical Report (CDM Smith 2014b). The low flow augmentation release results in substantial increases in minimum flow, 20th percentile flows, and median flows for all 7 months in which the low flow program is implemented.

The target flow reach is the Poudre River from the Glade Reservoir release downstream to the Timnath Lake Inlet diversion. This reach was identified for the following reasons: 1) the intended purpose of the low flow augmentation release is to improve low flow habitat for cold water fish, which generally do not maintain resident, reproducing populations in downstream reaches; 2) the reach includes the major winter dry-up points on the Poudre River, as municipal and irrigation return flows typically maintain base flows in downstream reaches; and, 3) the Timnath Lake Inlet provides an opportunity to recapture released water. Other mitigation measures in this plan mitigate effects on warm water aquatic species.

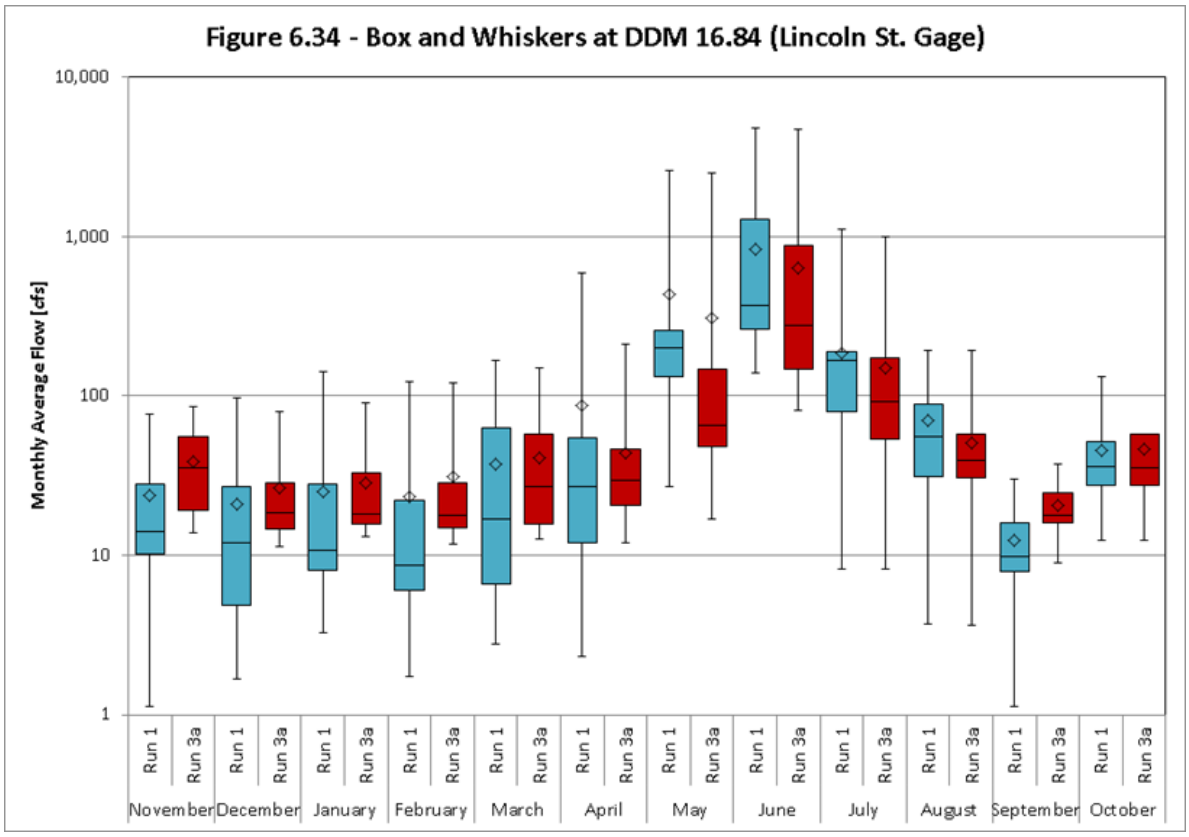

Figure 8. Box and Whiskers Plot for Lincoln Street Gage Streamflow (CDM Smith 2014b)

The exact method to return the water to Glade Reservoir will be determined between the SDEIS and the FEIS, but possible options include water exchanges. The release and recapture of the augmentation flows is allowed by the Northern Water decrees proposed to be used for NISP. Northern Water's Poudre Project Decree (Case No. 11CW242; diligence granted in 2013) provides for storage and specific beneficial uses. Use of the water for NISP is specifically recognized in the Poudre Project Decree (Poudre Project Decree, paragraph 7). The Poudre Project Decree provides for storage of 5,400 AF of water in Glade Forebay Reservoir and 220,000 AF of water in Glade Reservoir with the combined total storage not to exceed 220,000 AF [Poudre Project Decree, paragraphs 7.1.5 and 7.2.5]. Beneficial uses for the water include irrigation, municipal, domestic, replacement, recreation, industrial and production of electrical power and energy [Poudre Project Decree, paragraph 7.1.7]. Exchanges upstream to numerous points are decreed in paragraph 8A of the South Platte Decree (Case No. 11CW241; diligence granted in 2013).

Water which is stored in Glade Reservoir would become the property of Northern Water. Northern Water proposes to integrate this specific flow augmentation program into normal NISP operations under Alternative 2 by exercising its statutory right to release stored water for delivery downstream for a decreed beneficial use. Northern Water would inform the state and division engineers that the water released from storage is to be shepherded

downstream to a specified diversion point without being diverted by others, as provided and required by C.R.S. §37-87-103 Notice of Released Stored Waters.

As previously noted, as part of the Poudre Runs Through It group, there are several entities currently investigating opportunities to improve minimum flows through Fort Collins. If this group, or any other group, establishes a target flow rate greater than 10 cfs and flows are augmented with other water supplies to help meet that target flow, the 10 cfs low flow augmentation being proposed as part of NISP could be modified to be incorporated into that target minimum flow as long as the annual volumetric limit is maintained, the average annual release to maintain this flow is not increased, and the other aspects of the program are not materially different from those proposed herein.

3.2.5 Poudre River Flow Augmentation Protection (FW-05)

Legal protection of flow augmentation on the Poudre through Fort Collins would be advantageous to many of the flow commitments described in this plan. As previously described in Section 1.6.2, the Flows initiative of the Poudre Runs Through It working group is discussing and investigating legal mechanisms to protect flow augmentation through the City of Fort Collins, including a formal instream flow water right through the Colorado Water Conservation Board. Northern Water is currently working with this group regarding these options. Northern Water commits to continuing this dialog and supporting a legal mechanism for this protection as long as the legal protection is not potentially injurious to water rights associated with C-BT, Windy Gap, NISP, or other water rights held by Northern Water.

Additional streamflow measurement will be required to administer many of the streamflow commitments in this plan. Additional streamflow measurement is proposed as part of the multi-objective diversion structure retrofits (section 4.3.3) and as part of the streamflow and water quality monitoring program (section 4.4.3).

3.2.6 Multi-Level Outlet Tower for Glade Reservoir Releases (WQ-01)

Glade Reservoir would be designed and constructed with a multi-level outlet tower that would allow selective withdrawals from specific locations in the reservoir water column to tailor the water quality of the releases from Glade Reservoir as they relate to the water quality in the Poudre River. To the extent possible, release of augmentation flows (see section 3.2.4) in September and March would be made from the hypolimnion in Glade Reservoir if such releases would benefit water temperature downstream of the release point.

Deliveries from Glade Reservoir to Horsetooth Reservoir through a pipeline would be released either from Glade Reservoir through the multi-level outlet tower (if NISP water rights are not in priority) or through diversion from the Poudre River and pumping directly from the Glade Reservoir forebay. Water quality monitoring (section 4.4.3) combined with

the multi-level outlet tower and Poudre River diversion capabilities would be used to prevent water being delivered into Horsetooth Reservoir that would reduce the ability of municipal water providers to treat the water for municipal use. Analyses have shown that these operating schemes could be implemented so that installation of additional total organic carbon treatment processes at municipal treatment facilities would not be necessary to meet all applicable state and federal drinking water standards using currently available treatment processes and proven facility operating practices (Black & Veatch 2008).

Northern Water recently completed a similar multi-level outlet tower at Carter Lake (Figure 9). This tower was constructed as a redundant year-round outlet for municipal deliveries out of Carter Lake, and to allow municipal deliveries to be drawn from multiple levels of Carter Lake. The exact configuration of a multi-level outlet tower at Glade Reservoir, including gate spacing, screening requirements, and flow requirements, will be determined after consultation with CPW and the Colorado Division of Water Resources Dam Safety Branch.

Figure 9. Multi-Level Outlet Tower at Carter Lake

As described in the SDEIS, during initial fill of Glade Reservoir, water quality conditions in the reservoir may be affected by the release of nutrients and organic matter in the soil. Thus, during this period, water quality may be impaired by high suspended solids, elevated nutrient concentrations, and potentially high concentrations of algae. Northern Water will develop a reservoir water quality management plan that will describe and monitor water

quality conditions in the reservoir, and outline how water will be released to the river using the multi-level outlet tower given ambient conditions in the Poudre River, for both short-term (initial fill) and long-term operations.

Implementation of this avoidance technique would require establishment of real-time water quality monitoring points in the Poudre River upstream and downstream of the discharge points into the river, as well as monitoring of the discharge itself. The streamflow and water quality monitoring plan is further described in Section 4.4.3.

3.2.7 Ramp Hansen Supply Canal releases (FW-07)

Northern Water delivers C-BT water to irrigation water users in the Poudre River basin via Horsetooth Reservoir releases via the Hansen Supply Canal to the Poudre River. This water is then diverted at the irrigation water user's river headgate. These operations are coordinated daily with the District 3 water commissioner to ensure that water release from C-BT facilities is diverted at the correct location and time by the appropriate water user.

Occasionally, the timing of these operations can become inconsistent, resulting dramatic swings in water levels upstream and downstream of diversion structures over a very short time. For instance, if water is delivered to the river, and the water commissioner is not at the diversion structure at the exact time that that pulse of water reaches the diversion structure, there can be a very short period where high flows pass the diversion structure, then the water is nearly instantaneous reduced again as the diversion structure gates are adjusted by the water commissioner to divert the correct amount of water. These types of operations can be detrimental to fish, especially during spawning periods.

Northern Water commits to working with CPW and the District 3 water commissioner, and water users to improve existing delivery methods to minimize the effect of these operations on fish species. These improvements may include providing "ramping" of deliveries on both the increasing and decreasing limbs of the delivery hydrograph (over a period of minutes to hours), automating certain water user headgates to either be remotely controlled or have automatically adjusting gates to account for these deliveries, and improving communications between all parties.

3.3 Construction BMPs

Large construction projects like NISP typically have a long list of Best Management Practices that accompany Federal, State and local permitting activities. The following lists the more significant BMPs and/or those that are particular to NISP.

3.3.1 Typical Design and Construction BMPs (GC-01)

Northern Water commits to implementing the following BMPs for construction of facilities. The following BMPs would help avoid and minimize impacts to the environment. For brevity, this list describes only the more substantial construction BMPs.

- The clearing of vegetation would be limited to that which is necessary for the construction of the Project.
- All dredged or excavated materials, with the exception of those authorized, would be placed on an upland site above the ordinary high water mark in a confined area that is not classified as a wetland to prevent the return of such materials to the waterway.
- Deposition of excavated materials on shore and all earthwork operations on shore would be carried out in such a way that sediment runoff and soil erosion into the water is avoided. A soil-, sediment-, and erosion-control plan would be implemented.
- All construction debris (which includes excess dredge and/or fill materials, wood, cleared vegetation, concrete, and all other materials not specifically addressed in the permit) would be disposed of on land in such a manner that it cannot enter a waterway or wetland.
- Equipment for handling, conveying, and discharging materials during construction would be operated to prevent dumping or spilling the materials into wetlands and waters. Use of the machinery in waterways would be kept to a minimum. All work in waterways would be performed in such a manner to minimize increases in suspended solids and turbidity that may degrade water quality and damage aquatic life outside the immediate area of operation.
- Concrete trucks would be washed at a site and in such a manner that wash water cannot enter any wetland or waterway. Measures also would be employed to prevent wet concrete from entering any waterway.
- Only clean rock material from a non-streambed source would be used for riprap in order to avoid the introduction of fines, which would result in excessive local turbidity.
- All areas along the banks that would be disturbed or newly created by the construction activity (and are not to be riprapped) would be seeded and planted with vegetation indigenous to the area. This vegetation would include both herbaceous and woody species. These areas may require periodic maintenance, such as reseeding, replanting, watering, implementation of grazing restrictions, fencing, and noxious weed control, to ensure survival of revegetated areas. Riprapped areas, except for soil riprap, would not be further disturbed through vegetation control techniques.

- Measures would be employed prior to initiation of construction to prevent or control spilled petroleum products, chemicals, or other deleterious material from entering the water.
- A contingency plan would be formulated to be effective in the event of a spill.
- Aboveground fuel storage tanks would be diked or curbed, or contained by other suitable means, to prevent the spread of liquids in case of leakage in the tanks or piping.
- Fill created by the discharges would be properly maintained to prevent erosion and other nonpoint sources of pollution.
- Silt fencing or other types of construction fencing would be placed between the construction zone and existing (not to be disturbed) wetlands to prevent unauthorized impacts to wetlands.
- Dust-control procedures would be implemented throughout the construction process.
- Staging areas and equipment and material storage facilities would be located at or near sites either mostly or completely obscured from a majority of the observation points (Ops) and homes with views of the dam and/or reservoir alternatives.
- Construction equipment on-site for more than 10 days would be required to meet EPA 2007 on-road emissions standards (for on-road diesel equipment) or EPA Tier 4 emissions standards (for non-road diesel equipment). Idle reduction policies would be implemented and ultra-low sulfur diesel fuel or approved biodiesel blend would be required in all diesel equipment.
- Construction equipment would be operated to function as designed and conform to applicable noise emission standards.
- The contractor would be required to adhere to project work hour restrictions.
- Access to construction areas would be restricted so that the public would not be in close proximity to loud equipment or blasting.
- A blasting schedule and notification process would be developed for nearby residents when blasting is anticipated to occur. Blasting would be preceded with a warning alarm. Blasting plans would include the implementation of seismographs for vibration measurements and air blast recordings for noise.

- Operating equipment (e.g., pump stations) would be located in structures designed to minimize radiated noise outside the structure, and structures would be designed to meet local noise ordinance requirements.
- A noise monitoring and noise mitigation plan would be developed if activities are expected to exceed maximum permissible noise levels.
- Access during construction would be provided to existing access roads and intersections, and temporary road closures would be avoided or minimized.
- Any permanent road relocations would be designed and constructed according to jurisdictional standards.
- Relocation of electrical transmission lines would be coordinated with owners of such lines using methods and processes typically used by those owners.

3.3.2 Stormwater Management Plan (GC-02)

Northern Water would require the contractor to implement a construction stormwater management plan at all construction sites. The plan would be developed in accordance with the State of Colorado Water Quality Program. A plan, application, and permit would be developed and acquired pursuant to the requirements and guidance of the Colorado Department of Public Health and the Environment (CDPHE). The application would include the required construction dewatering discharge permits, downstream user notifications, and onsite documentation. The permit may require water testing on a specified schedule for water discharges during construction. A complete erosion- and sediment-control program overseen by a professional consultant would be administered. BMPs such as silt fencing would be established and maintained to minimize sediment from reaching wetlands and waters that would not be filled. The fencing would also serve to delineate the limits of project disturbance. Northern Water will monitor compliance with the plan by the contractor.

3.3.3 Relocation of U.S. 287 (GC-03, GC-04, GC-05)

Northern Water commits to work with the Colorado Department of Transportation (CDOT) on the relocation of U.S. 287 if the Proposed Action is permitted. Northern Water commits to the following regarding its coordination with CDOT on the relocation of U.S. 287:

- Final design would follow the design configuration and criteria as outlined in the U.S. 287 Relocation Study (Muller 2007) for Alignment F, which includes the following. Final configuration would be coordinated and approved by CDOT.
    - Constructing the intersection of Highway 14 and the new U.S. 287 alignment with continuous flow on U.S. 287, continuous flow from eastbound Highway 14 to southbound U.S. 287, a deceleration and left turn

lane from northbound U.S. 287 to westbound Highway 14, a deceleration and right turn land from southbound U.S. 287 to westbound Highway 14, and stop control for eastbound Highway 14 to northbound U.S. 287, including an acceleration land on northbound U.S. 287.

- Reconstructing the intersection at Ted's Place so that Highway 14 is continuous flow, and stop control is on the old U.S. 287 alignment to the north, which would be reconfigured to provide access to the Glade Reservoir complex.
- Providing new paved access to the south entrance to Bonner Spring Ranch Road and Big Ridge Way from U.S. 287 via the existing frontage road. This road would also be used to access state trust lands and national forest lands on the west side of Glade Reservoir (section 4.6.1). Northern Water would coordinate with CDOT to provide appropriate intersection configuration.

- All property acquisition would follow the CDOT Right of Way Manual and the Federal Uniform Relocation and Real Property Acquisition Act. CDOT oversight and coordination would be required during this process.
- The final design of the highway would be done with CDOT oversight. Design shall meet all applicable CDOT, American Association of State Highway and Transportation Officials, and Larimer County requirements. A Project Scoping meeting, Field Inspection Review, and Final Office Review would be conducted following CDOT procedures.
- Final Plan, Specification and Estimate approval along with environmental clearance, right-of-way clearance, and utility clearance would be obtained from CDOT prior to advertisement of the project for construction.
- CDOT and Northern Water would prepare intergovernmental agreements to address Preconstruction, Construction, Ownership, and Maintenance responsibilities.
- Northern Water would coordinate with utility companies on the design and relocation of impacted facilities.
- Northern Water would conduct a detailed geotechnical and pavement study for the final design.
- Northern Water would conduct a slope stability/landslide evaluation and rockfall study for the hogback cut area. The preliminary design of the rock cut may be modified to accommodate rock fall and snow storage requirements.

- In order to mitigate potential icing and blowing snow conditions on the roadway at the hogback cut, the use of intelligent transportation system technologies, including variable message signs, pavement sensors, video monitoring, and weather station technologies would be considered. Dynamic speed limits correlated to roadway conditions, communicated through the variable message signs, would also be considered.

- Following construction, the rock cut area would be monitored with regard to icing and blowing snow conditions and appropriate mitigation, should it become necessary, would be designed and implemented based upon in-place field conditions.

Northern Water would work with CDOT to minimize adverse visual effects of the road as the road would alter views of some locations in the project area. The following mitigation measures would be pursued with CDOT to minimize the contrasts between the road and its surroundings.

3.3.3.1 Soil Cuts

- Smoothly transition the upper 10 feet of cut face into undisturbed ground by rounding to diminish visible edges.

- Preserve existing rock outcrops outside of clear zone and within construction limits to vary cut face slope, composition, color, and texture. Undulate or roughen cut face to match existing land shapes.

- Preserve selected existing individual trees and/or shrubs outside clear zone and within construction limits for the same reasons stated above.

- For placement of surface stones, use only stones salvaged from the ground surface prior to construction.

- Revegetate by seeding and/or planting with native plants.

- Dry-lay stone boulders at the clear zone edge to retain low height soil cut slopes (<5 feet) in appropriate locations with existing surface boulders or rock outcrops.

- Shape cut slope faces to blend with adjacent undisturbed slopes.

3.3.3.2 Rock Cuts

- Manipulate blasting patterns to create rock surfaces, terraces, and ridges similar to undisturbed rock faces and outcrops.

- Shape cut faces to blend with adjacent undisturbed rock faces.

- Create soil pockets within the terraces and ridges of cut faces to accommodate and promote revegetation at appropriate locations. Locate, size, and shape soil pockets to replicate the planting areas of undisturbed rock faces.

3.3.3.3 Fills

- Combine terracing, surface stone placement, and revegetation similar to adjacent undisturbed ground surfaces and land forms.
- Construct new fill slopes using terraces, native stones, and native plants. The size, shape, and location of terraces should be similar to the adjacent undisturbed landforms. The density and placement of stones and plants also should be similar to the density and placement of adjacent undisturbed stones and plants.
- Connect new fills to adjacent undisturbed slopes by developing similar landforms and drainage patterns.
- Revegetate by seeding and/or planting with native species.

3.3.3.4 Retaining Walls

- Treat exposed and visible concrete retaining wall faces and tops with form liners or stone facing to be similar to undisturbed rock outcrop surfaces.
- Treat mechanically stabilized earth wall face and tops with pre-cast concrete panels or dry-laid stone. Pre-cast panels should be complimentary to undisturbed rock outcrop surfaces.

3.3.4 Air Quality (AQ-01)

To minimize and control fugitive dust, Northern Water would develop and implement a fugitive particulate emission control plan that identifies specific steps that would be taken to minimize fugitive dust generation.

3.3.5 Migrating Birds and Raptors (TW-03, TW-04, TW-05)

Where possible, vegetation clearing would occur during the nonbreeding period, prior to construction. If active nests are found during preconstruction surveys, they would be left undisturbed and “no-work” zones would be established around the nests until the breeding season is over. The installation of nesting deterrents to prevent nesting before April 1, and removal of these deterrents no more than 24 hours before initiation of the project, is an acceptable alternative to prohibiting construction activity during the breeding season. In cases where removal of a nest is necessary, a permit would be requested from the Service. Nesting surveys would be conducted prior to the initiation of construction activities to identify migratory bird nests in the construction right-of-way.

CPW developed recommended buffer zones and seasonal restrictions for new surface occupancy within certain distances of nest sites of several raptor species. Surface occupancy is defined as human-occupied buildings and other structures such as oil and gas wells, roads, railroad tracks, and trails. The Service typically considers that implementation of the CPW buffers and seasonal restrictions fulfill compliance requirements of the Migratory Bird Treaty Act for raptors.

A raptor nest survey would be conducted prior to project construction to identify raptor nests in the vicinity of the proposed Project. If an active raptor nest is found on-site, CPW recommended buffers and seasonal restrictions for raptors would be established during construction to avoid nest abandonment.

If disturbance of raptor nests is unavoidable, mitigation measures could include the construction of artificial nests in suitable habitat or enhancement of prey habitat. If raptor nests could be impacted by the proposed Project, specific mitigation measures for impacts to nesting raptors would be developed by Northern Water in coordination with CPW and the Service prior to construction.

3.3.6 Paleontological Resources for U.S. 287 Realignment (CR-04, CR-05)

Prior to construction of the U.S. 287 realignment, Northern Water would coordinate with the CDOT staff paleontologist to examine the final design plans and determine the extent of bedrock impact and the scope of paleontological monitoring required.

3.3.6.1 Construction Monitoring

Before the construction permit is issued by CDOT, a qualified and permitted paleontologist (Project Paleontologist) would be retained by Northern Water to produce a project-specific paleontological resource mitigation plan. The Project Paleontologist and Northern Water would be responsible for implementing the mitigation measures in coordination with CDOT. This includes supervising the monitoring of construction excavations in areas with paleontological sensitivity.

The Project Paleontologist would attend preconstruction meetings to consult with the grading and excavation contractors. Language would be placed in the construction specifications stating that the Project Paleontologist would be on-site during grading or trenching operations. The construction contractor would be instructed via the written specifications and at the preconstruction meeting to stop construction if fossils, as verified by the Project Paleontologist, are unearthed. Work would cease within the vicinity of the fossils so they can be recovered and removed from the site.

All project personnel would be required to attend a Worker Awareness Training Program prior to initiation of construction activities. The Project Paleontologist would administer the paleontological resource portion of the training program. The program would educate

construction personnel on the types of fossils that could be found in project excavations, their appearance, procedures to follow should they be found, and penalties for illegal collecting.

Paleontological monitoring would include inspection of exposed rock units and microscopic examination of matrix to determine if fossils are present. This work would take place during construction. Depending upon the types and significance of potential fossils, monitoring would be scheduled to take place continuously or to consist of spot checks of construction excavations. Paleontological monitors would follow earth-moving equipment and examine excavated sediments and excavation sidewalls for evidence of significant paleontological resources. The Project Paleontologist would have authority to temporarily divert grading away from exposed fossils in order to professionally and efficiently recover the fossil specimens and collect associated data. All efforts to avoid delays to construction would be made.

If microfossils are present, the Project Paleontologist would collect excavated material (matrix) for screen washing. To expedite removal of fossiliferous matrix, the Project Paleontologist may request heavy machinery assistance to move large quantities of matrix out of the path of construction to designated stockpile areas. Testing of stockpiles would consist of screen-washing small samples (approximately 200 pounds) to determine if significant fossils are present. Productive tests would result in screenwashing additional matrix from the stockpiles to a maximum of 6,000 pounds per locality to ensure recovery of a scientifically significant sample.

At each fossil locality, field data forms would be used to record the locality, measured stratigraphic sections, and appropriate scientific samples that were collected.

In the event of discovery of unanticipated fossil remains, such as unexpected concentrations of fossils, unusually large specimens, or unexpected discoveries in sediments, all ground disturbances in the area would cease immediately. The Project Paleontologist and appropriate project personnel would be notified immediately to assess the significance of the find and make further recommendations.

If any subsurface fossilized bones or other potential fossils are found by construction personnel, work in the immediate area would cease immediately, and the Project Paleontologist would be contacted immediately to evaluate the significance of the find. Once salvage or other mitigation measures (including sampling) are complete, the Project Paleontologist would notify the construction supervisor that paleontological clearance has been granted.

The Project Paleontologist would have the authority to downgrade the monitoring effort in consultation with CDOT if the paleontological potential of the project area is found to be less than anticipated.

In the laboratory, all fossils would be prepared, identified, analyzed, and inventoried. Specimen preparation and stabilization methods would be recorded for use by the designated curation facility.

3.3.6.2 Reporting

A final paleontological monitoring report would include the results of the monitoring and mitigation program, an evaluation and analysis of the fossils collected (including an assessment of their significance, age, and geologic context), an itemized inventory of fossils collected including photographs where appropriate, an appendix of locality and specimen data with locality maps and photographs, an appendix of curation agreements and other appropriate communications, and a copy of the project-specific paleontological monitoring and mitigation plan.

All significant fossil specimens would be transferred to an appropriate curation facility such as a public museum. The fossils would be accompanied by the final paleontological mitigation report with all data in hard and electronic copy. The fossils would be curated and permanently housed in the curation facility where they would be available for study, education, and display. The final report would be provided to CDOT, the Corps, and Northern Water.

3.4 Hazardous Sites

Hazardous sites requiring mitigation include the TCE plume near the Glade Reservoir forebay and oil and gas wells at the Galeton Reservoir site. Mitigation at the TCE plume is proposed to mitigate any potential risk of NISP affecting the plume, or the plume affecting NISP water supplies. Mitigation at oil and gas well sites is proposed to prevent contamination of water stored in Galeton Reservoir and to reduce the possibility of mobilization of any existing or future contaminant plume that would have otherwise remained in place or remained less mobile.

3.4.1 Trichloroethylene Plume at Glade Reservoir Forebay (HZ-01)

Trichloroethylene contaminated ground water is present beneath the northwest corner of the proposed forebay. The trichloroethylene release occurred from operations at the Former Atlas “E” Missile Site 13, located in Laporte, Colorado (Figure 10). The facility was developed in the late 1950s as an intercontinental ballistic missile facility. Operations at the site were phased out by 1965. Trichloroethylene was used at the site to flush the fuel tanks after missile readiness tests. Waste TCE and residual rocket fuel was dumped into a pit that flowed to a wastewater drainage sump that discharged to the ground surface.

Northern Water has worked closely with the Corps Omaha District to evaluate potential impacts Site 13 may have on the proposed Glade Forebay. Studies indicate that the Site 13 trichloroethylene plumes would not impact the forebay.

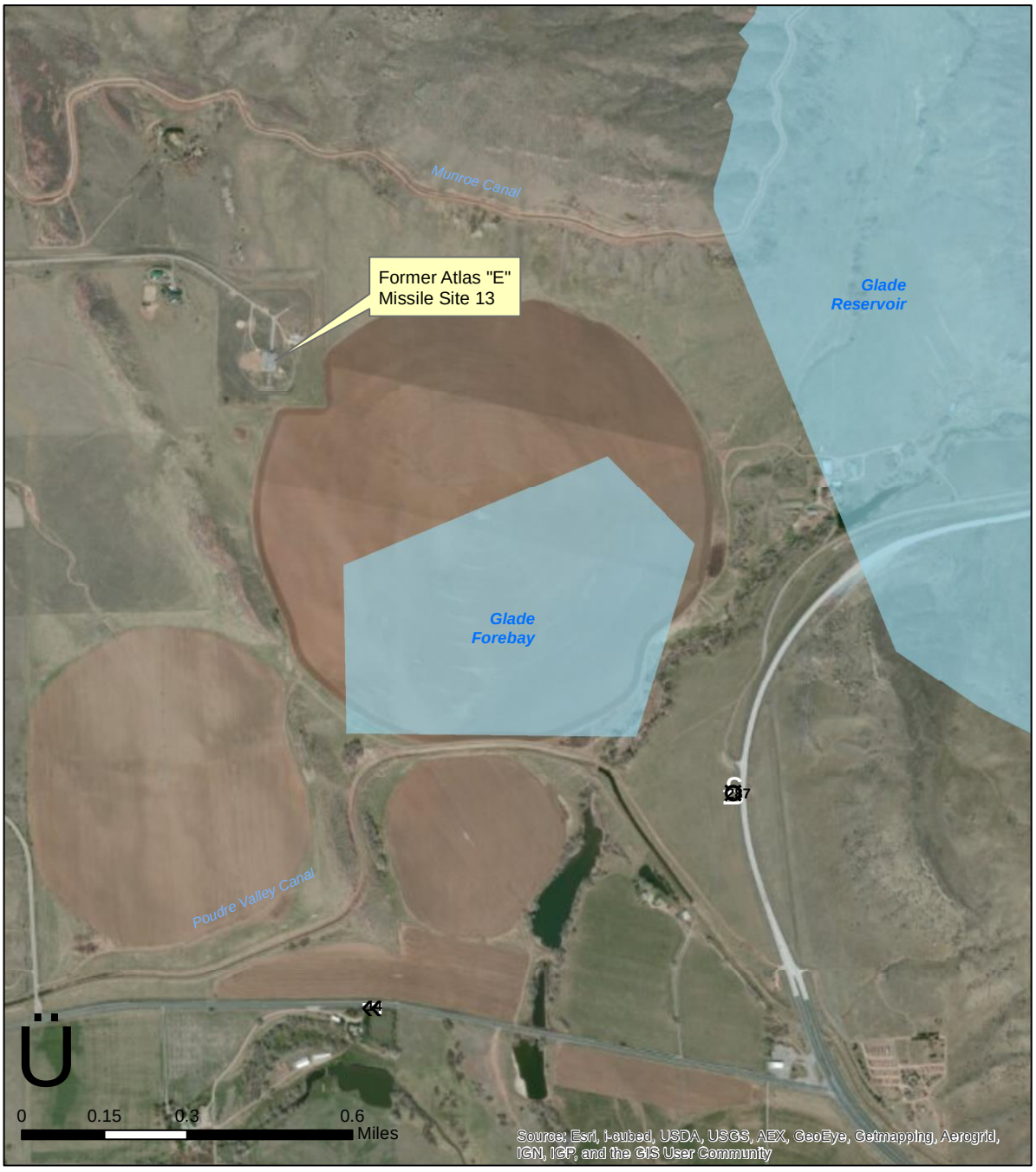

Figure 10. Location of Former Atlas "E" Missile Site 13

The Corps has recently released the final Decision Document for remedial action at the site to address environmental threats remaining at the site, including possible use of the groundwater for drinking water by property residents (Corps 2014). The goal of the remedy is to remediate the chemicals of concern in groundwater at Site 13 to meet federal maximum contaminant levels (MCLs). The selected remedy is anticipated to remediate the groundwater at the site in less than 5 years. Major components of the selected remedy include:

- Installation of injection points within the contaminated area.
- Initial and subsequent rounds of in-situ chemical oxidation treatment (which were successful in pilot studies at the site in 2012).
- Periodic sampling of Site 13 monitoring wells to ensure chemicals of concern in groundwater meet the cleanup standards.

Recent correspondence from the Corps indicates that the cleanup approach currently being implemented is working well (Fields 2015).

Although trichloroethylene has been determined by the Corps to not have impacts on the Glade Forebay, and remedial action at the site is anticipated to remediate groundwater at the site by the time the project is on-line, Northern Water commits to the following mitigation actions to ensure no adverse effects from the trichloroethylene plume:

- Designs for the forebay would include an impermeable lining along the walls and bottom of the forebay to eliminate seepage losses/gains during operation of the forebay.
- Well abandonment would occur in accordance with the regulations of the Colorado Division of Water Resources for the monitoring wells within the forebay construction area prior to excavation activities to assure there is no potential pathway for trichloroethylene contamination.
- Ground water encountered during excavation activities within the northwestern corner of the forebay would be periodically tested for the presence of trichloroethylene to ensure proper disposal and worker health and safety.
- If used, water wells for construction water supply would not be screened within the trichloroethylene plume area.

The Corps and Northern Water would develop an agreement prior to construction of the forebay that determines the respective responsibilities of the Corps and Northern Water for implementing these mitigation measures.

3.4.2 Oil & Gas Wells at Galeton Reservoir (HZ-02)

Several oil and gas wells are currently operational at the Galeton Reservoir site. Northern Water has cooperated with and reviewed plans by the well operators to ensure that the operator's oil and gas development plans are consistent with the construction of Galeton Reservoir. Northern Water will remain in contact and coordinate with the operator as these activities progress.

Northern Water has received recommendations from the EPA for proposed mitigation of potential issues related to oil and gas wells during construction and operation of Galeton Reservoir. Northern Water will perform the following:

- Develop a plan to assess the mechanical integrity of active and abandoned oil and gas wells:
    - Review subsurface well construction and plugging and abandonment records for all oil and gas wells within the inundation area.
    - Perform mechanical integrity testing prior to plugging and abandonment.
    - Check the bradenhead for pressure prior to plugging and abandonment; wells with bradenhead pressures would need additional remedial cementing prior to abandonment.
    - Remove all pit materials (not just spill areas).
    - Ensure that wellhead location information is accurate to within less than half the diameter of the outermost casing string.
    - Monitor soil gas at each well site for methane to identify leaks prior to submerging.
    - Evaluate historic plugging and abandonment practices in the area and consider the possibility of unknown, abandoned oil and gas well locations in the footprint. If potential exists, use geophysical survey methods to locate these wells. Once located, these wells should be tested, monitored and/or plugged if necessary.
- Disclose whether excavation will occur in the oil and gas well area. Develop protocols to avoid or minimize impacts to mechanical integrity of existing oil and gas wells during excavation and construction, including best management practices.
- Develop protocols that would be followed in the event that a leaking oil and gas well is discovered after reservoir filling, specifying:
    - Methods to identify and fix leaking wells;
    - Water management if the reservoir must be drained;
    - Protective or ameliorative measures that could be taken if contamination of the reservoir occurs; and
    - Roles of the Colorado Oil and Gas Conservation Commission, the well owner/operator, the Corps, and Northern or its participants.

- Describe expected water level fluctuations at Galeton, their effect on groundwater, and any monitoring necessary to identify contaminant flow into or away from the reservoir.

SECTION 4. COMPENSATORY MITIGATION

As would be expected for a project with the scope of NISP, not all environmental effects can be avoided or minimized. Therefore, compensatory mitigation is required to mitigate certain effects of the Project. This section describes the development of conceptual compensatory mitigation plans for impacted resources. A summary table of the Conceptual Mitigation Plan is contained in Appendix A.

Some mitigation measures described in this section involve providing funding to state agencies, primarily Colorado Parks and Wildlife, to manage programs relating to this mitigation plan. This funding is proposed to be in addition to funding already received by state agencies, and not to replace any source of funding. Northern Water expects the agencies to continue seeking current funding sources and not rely on funding from this mitigation plan to replace current funding.

4.1 Wetlands and Preble's Habitat

The Wetlands and Other Waters Technical Report (ERO 2008b) provides detailed information and a summary of proposed compensatory wetland mitigation areas. The Glade Reservoir site would be the primary compensatory wetland mitigation site and would also serve as Preble's Habitat to mitigate for the loss of Preble's Habitat for Glade Reservoir construction (Table 4). The U.S. 287 realignment would have its own mitigation site. The Galeton Reservoir compensatory wetlands would be at the Eaton Draw constructed wetlands (see section 4.4.2), which would also reduce water quality constituent loading in the lower part of the Poudre Basin and serve as wetlands mitigation bank for other incidental wetlands disturbance that may occur during pipeline construction.

Table 4. Summary of Upland Wetland Compensatory Mitigation Sites

Project Component	Location	Acreage Required [(1)]	Acreage Estimated
Glade Reservoir	Below the Glade Reservoir Dam	41.6	56
Galeton Reservoir	Eaton Draw constructed wetlands	0.3	10
U.S. 287 Realignment	Between Wetlands 14 and 15 in the U.S. 287 realignment study area	2.5	3

[(1)] See SDEIS for full disclosure of wetlands effects.

Northern Water will maintain all constructed wetlands to provide the required wetlands mitigation area and type described in this plan. In the event that portions of the constructed wetlands are disturbed or do not function as intended, Northern Water will remedy the affected area as soon as reasonably possible.

4.1.1 Glade Reservoir and Forebay (WL-01, SS-01)

The majority of wetland impacts for Glade Reservoir would be compensated by the creation of three types of wetlands below Glade Dam (Figure 11). The total of 56 acres of potential mitigation for wetlands is larger than the total permanent wetland impacts for Glade Reservoir (between 43 and 44 acres) because this plan is preliminary and conceptual. When the plans are finalized, the size of the proposed wetland mitigation sites would be adjusted to replace the wetlands lost on an acre-for-acre basis with wetlands similar in types and functions provided for the wetlands lost, including those wetlands permanently affected by other components of the final NISP alternative (except the Highway 287 Realignment, which has its own wetlands compensatory mitigation site).

4.1.1.1 Between the Dam and Forebay

A series of depressions would be constructed between the dam and forebay on either side of the existing tributary to the Poudre River. These wetlands would be designed as a series of depressions where water seeping from the toe drains of the dam and/or water from the forebay would be allowed to slowly flow through the depressions, creating hydric soil conditions and supporting wetland vegetation. The wetlands would be designed to be similar to the large herbaceous wetlands (Wetlands 4, 5, and 6) near the existing U.S. 287 that would be inundated by the proposed Glade Reservoir. Appropriate native herbaceous wetland species would be planted. Along edges, especially near the tributary to the Poudre River, native trees and shrubs would be planted to provide woody riparian habitat for wildlife, especially the threatened Preble's meadow jumping mouse. These replacement wetlands would be designed to have high-quality functions for general wildlife habitat, sediment nutrient/toxicant removal, and production export/food chain support (ERO 2008b).

Nearly all land at this site is currently owned by Northern Water, with a small parcel privately held.

4.1.1.2 Wetland Fringe around Forebay

Wetlands would be constructed on a shallow shelf around the edge of the forebay. This shelf would be constructed between about 1 foot below and about 1 foot above the normal water level of the forebay. Appropriate native wetland plants would be planted. Along the outer edges, cottonwoods, sandbar willows, and other appropriate native trees and shrubs would be planted. These replacement wetlands would be designed to have high-quality functions for general wildlife habitat and sediment/shoreline stabilization (ERO 2008b).

Most of the land surrounding the forebay is currently owned by Northern Water, with a small parcel privately held.

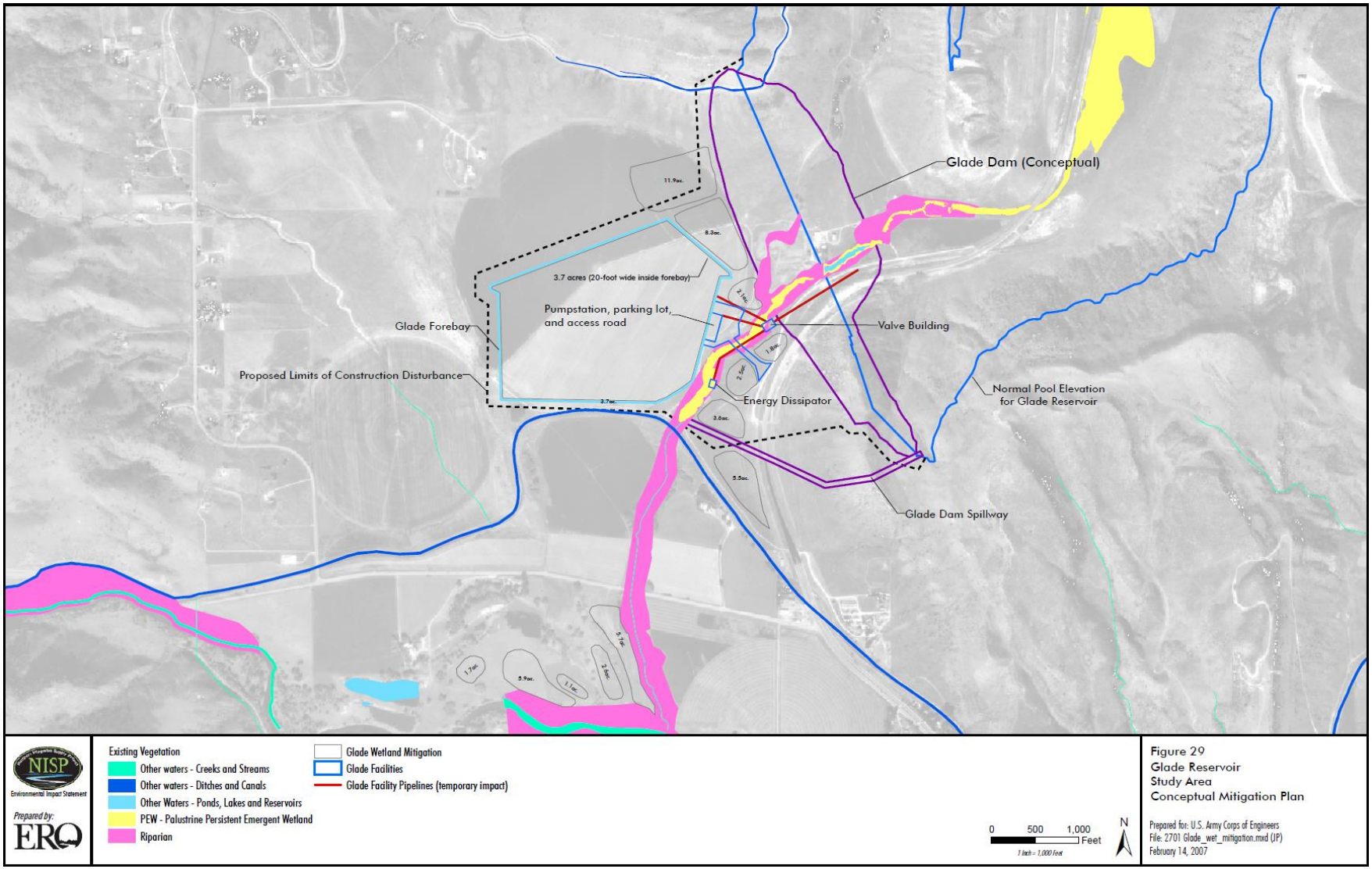

Figure 11. Glade Reservoir Compensatory Wetland Mitigation Sites (ERO 2008b)

4.1.1.3 North of the Poudre River

A series of wetland depressions would be constructed on the broad floodplain north of the Poudre River and west of the tributary. It is likely that ground water associated with the Poudre River is close to the surface in this location and that the depressions could be excavated to have ground water provide the supportive hydrology for the wetlands. Water could also be piped from the Glade Reservoir dam and the forebay. Appropriate native wetland herbaceous materials would be planted. Along the edges, especially near the tributary to the Poudre River, native trees and shrubs would be planted to provide woody riparian habitat for wildlife, especially for the threatened Preble's meadow jumping mouse. These replacement wetlands would be designed to have high-quality functions for general wildlife habitat, sediment nutrient/toxicant removal, and production export/food chain support (ERO 2008b).

All of the land for this wetland site is currently privately held.

4.1.2 U.S. 287 Realignment (WL-02)

Compensatory mitigation to replace 2.5 acres of wetlands that would be permanently disturbed for the U.S. 287 realignment would be constructed adjacent to Wetlands 14 and 15 and the connecting intermittent stream in an area south (down gradient) from the Poudre Valley Canal (Figure 12). The Wetland 14 and 15 location is approximately 1 mile north-northwest of the southern intersection of the new alignment and existing alignment, and on land currently owned by Holcim, Inc. (cement plant). The mitigation site would be graded to the elevation of the existing wetlands. Water from the adjacent intermittent stream and, if necessary, the Poudre Valley Canal, would support these wetlands. Similar herbaceous wetland vegetation to the vegetation growing in Wetlands 14 and 15 would be seeded in the mitigation site (ERO 2008b).

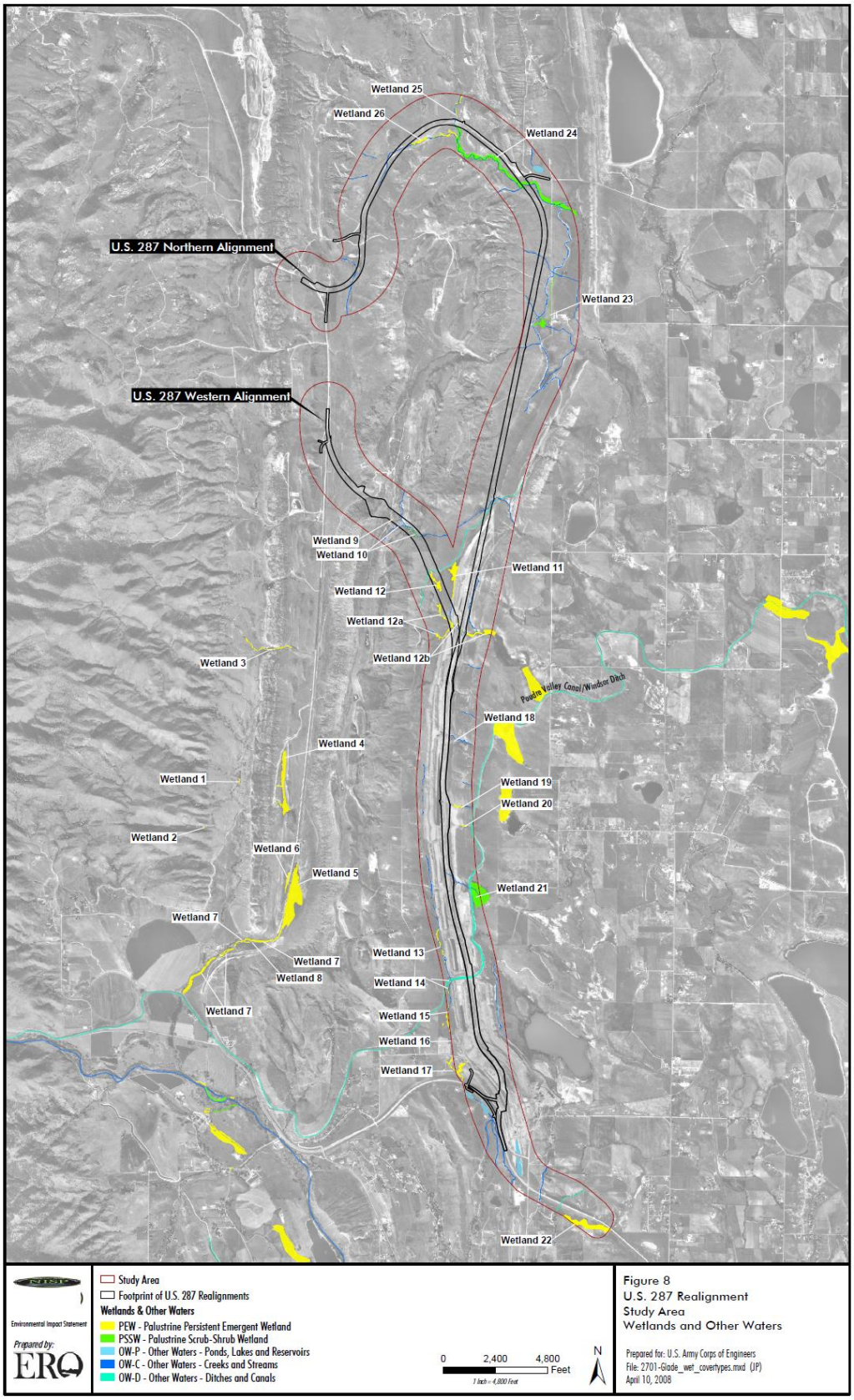

Figure 12. U.S. 287 Realignment Wetland Sites (ERO 2008b)

4.2 Other Special Status Species

Northern Water has developed the following proposed mitigation activities associated with other Special Status Species (for all of those other than Preble's, which was addressed in section 4.1). Northern Water will finalize mitigation for Special Status Species during the CPW Fish and Wildlife mitigation planning process (section 1.4.4.1).

4.2.1 Bald Eagle (SS-02)

Future Monitoring. Northern Water would perform future surveys for bald eagle nests and roosts. Because bald eagles may select new nest or roost sites, potentially impacted areas would be reevaluated prior to construction for the presence of bald eagle nest and roost sites within the CPW recommended disturbance buffers in effect at that time.

Existing Bald Eagle Nest. No activities associated with construction would occur within ½ mile of the bald eagle nest at Greeley's Bellvue water treatment facility from November 15 through July 31. To the extent possible, construction of pipelines and other facilities associated with the proposed Project would be avoided within ¼ mile of the nest. No cottonwoods more than 12 inches in diameter at breast height within ½ mile of the nest would be cut during pipeline construction. Specific mitigation measures would be determined in consultation with the Service.

Delisting of Bald Eagle. Northern Water would comply with the Bald and Golden Eagle Protection Act and any Service or CPW guidelines to minimize impacts to bald eagles and their habitat.

4.2.2 Colorado Butterfly Plant (SS-03)

The Service concurred that surveys for Colorado butterfly plant would not be required for portions of the Glade Reservoir; U.S. 287 realignment; Glade to Horsetooth, Carter, and Cactus Hill pipelines; SPWCP forebay; and diversion study areas where no suitable habitat was found. The Service has requested that suitable Colorado butterfly plant habitat in the Glade Reservoir and U.S. 287 realignment study areas be resurveyed for two years during the Fort Collins blooming period. In addition, although no known populations of Colorado butterfly plant occur in any of the study areas, prior to construction, Colorado butterfly plant habitat assessments and/or final surveys are recommended for potential habitat in the Poudre Valley Canal, SPWCP pipeline, and Glade to Horsetooth pipeline study areas. If Colorado butterfly plant is found within the construction footprint, specific conservation measures would be developed in coordination with the Service. Conservation measures could include avoiding impacts by establishing a "no-work" zone or, in the event of unavoidable impacts, protecting or enhancing adjacent or off-site habitat. Other mitigation methods include reestablishing populations in areas with suitable habitat.

4.2.3 Ute Ladies Tresses Orchid (SS-04)

The Service concurred that surveys for Ute ladies tresses orchid would not be required for portions of the Glade Reservoir; U.S. 287 realignment; Glade to Horsetooth, Carter, and Cactus Hill pipelines; SPWCP forebay; and diversion study areas where no suitable habitat was found. The Service has requested that suitable Ute ladies tresses orchid habitat in the Glade Reservoir and U.S. 287 realignment study areas be resurveyed for two years during the Fort Collins blooming period. In addition, although no known populations of Ute ladies tresses orchid occur in any of the study areas, prior to construction, Ute ladies tresses orchid habitat assessments and/or final surveys are recommended for potential habitat in the Poudre Valley Canal, SPWCP pipeline, and Glade to Horsetooth pipeline study areas. If Ute ladies tresses orchid is found within the construction footprint, specific conservation measures would be developed in coordination with the Service. Conservation measures could include avoiding impacts by establishing a "no-work" zone or, in the event of unavoidable impacts, protecting or enhancing adjacent or off-site habitat.

4.2.4 Platte River Target Species (SS-05)

All of the NISP Participants and Northern Water will be members in good standing of the South Platte Water Related Activities Program, Inc. The operation of Colorado's Future Depletions Plan under the Platte River Recovery Implementation Program would offset new depletions to the South Platte River Basin associated with NISP and its effects to the target species, whooping crane critical habitat, and other listed species in the central and lower Platte River addressed in the Platte River Programmatic Biological Opinion.

4.2.5 Black-footed Ferret (SS-06)

Existing prairie dog colonies may expand and new colonies may become established before project construction begins. Thus, prairie dog colonies potentially impacted during construction of project components would be reevaluated prior to construction, and any new or expanded colonies of over 80 acres would be surveyed for black-footed ferrets according to the protocol in effect at the time. The 247-acre prairie dog colony at the Galeton Reservoir study area has been permanently cleared by the Service for the presence of black-footed ferrets and additional surveys are not required at that site. An additional, 118-acre colony occurs just beyond the northwestern edge of the Galeton Reservoir. It is unlikely that a population of black-footed ferrets occurs in this colony, the Service has exempted this colony from black-footed ferret survey requirements (Service 2006).

4.2.6 Black-tailed Prairie Dog (SS-07)

Prairie dogs potentially impacted by construction of reservoir, pipelines, or other project facilities should be removed prior to construction. Two options typically exist for prairie dog removal: relocation and extermination. Controlling prairie dogs by removal and

relocation requires a permit from the CPW. Prairie dogs cannot be moved to another county without the approval of the board of county commissioners of that county.

Options for removing prairie dogs are summarized in order of preference, as follows:

- Relocation to a suitable on-site location.
- Relocation to an off-site location. This option may be suitable if greater than 25 animals are to be removed and a suitable release site has been identified and approved by the CPW.
- Passive relocation, a nonlethal land management activity designed to encourage prairie dogs to relocate to areas outside of the disturbance footprint. This option is most effective when only a small area of a prairie dog colony would be impacted, such as for trail construction. It should only be considered if sufficient suitable habitat is found adjacent to the area to be disturbed. This option should not be considered if it could result in the colonization of lands not in the project area, or if the impacted area is greater than a few acres.
- Live capture and donation to the Service's black-footed ferret recovery program or an approved raptor rehabilitation program as a food source. The services of a professional or qualified volunteer organization should be retained to capture and transport the animals to the designated location.
- Lethal control. Prairie dogs are euthanized in their burrows with the use of a chemical fumigant or asphyxiant. This option should be used only as a last resort. Extermination should be conducted by a professional prairie dog exterminator.

For the U.S. 287 realignment, in areas where avoidance of prairie dog colonies is not possible, CDOT guidelines for mitigating impacts would be followed, which include the identification of suitable prairie dog relocation sites, as well as coordination with CPW on approved removal methods (CDOT 2005). To facilitate determining adequate mitigation measures, an assessment of habitat quality and number of individual prairie dogs would be conducted for prairie dog colonies that would be directly affected by project construction. Prairie dogs would only be removed in areas where they might be directly affected, leaving them in the remainder of the construction ROW. In addition, some areas temporarily disturbed during construction would likely be recolonized by prairie dogs.

4.2.7 Swift Fox (SS-08)

Preconstruction surveys for swift fox den sites within appropriate habitat at dam sites and along pipeline corridors and proposed reservoir sites would be conducted based on protocols approved by CPW. If active swift fox dens are found, CPW would be contacted to determine if conservation measures are necessary and can be developed and

implemented. Construction activities would not commence within 250 yards of active dens until after appropriate conservation measures have been developed and implemented.

4.2.8 Burrowing Owl (SS-09)

Prairie dog colonies would be surveyed for burrowing owls prior to any work that would disturb them between March 15 and October 31. Where burrowing owls are present, prairie dog removal would be scheduled to occur from November 1 to March 14. If burrowing owls are found within the construction footprint, nests would be left undisturbed during construction. If burrowing owls are found during preconstruction surveys, additional avoidance mitigation measures would be developed in coordination with the CPW.

4.2.9 Other Riparian Species (SS-10)

Mitigation measures described in this document for Preble's meadow jumping mouse, wetlands, riparian areas, and aquatic habitat, such as habitat reconstruction and/or replacement, would also benefit the common gartersnake, northern leopard frog, smokey-eyed brown butterfly, twospotted skipper, and American currant. Implementation of water quality mitigation would also reduce potential impacts to these species.

4.2.10 Bell's Twinpod (SS-11)

Bell's twinpod would be impacted by the U.S. 287 realignment. In addition, if the Munroe Canal relocation option is chosen, surveys for Bell's twinpod would be conducted in appropriate habitat prior to construction. Recommended mitigation measures for Bell's twinpod include avoiding densely populated areas and large patches (density categories 3 and 4) as much as possible. For areas with Bell's twinpod that are unavoidably impacted, populations would be reestablished as much as possible after construction. The following revegetation measures would be used to reestablish this species in areas disturbed by construction:

- Establish Bell's twinpod restoration areas in shale areas to be disturbed by construction.
- Prior to construction, harvest Bell's twinpod seed during the appropriate season (mid to late summer).
- During construction, do not grade Bell's twinpod restoration areas to a uniform 3:1 or 4:1 slope. Leave shelves of shale and uneven slopes similar to existing undisturbed outcrops.
- After construction, do not place topsoil on Bell's twinpod restoration areas; leave the shale substrate on the surface.

- Spread the harvested Bell's twinpod seed either sparsely mixed with other associated native species or by itself. Do not reseed these areas with the grass mix used on other revegetated slopes because Bell's twinpod only grows in sparsely vegetated areas.

4.3 Poudre River Channel Improvements

NISP would affect several environmental resources that are connected to the Poudre River channel from the Poudre Valley Canal diversion at the mouth of the canyon to its confluence with the South Platte east of Greeley, including water quality, stream morphology, fish and aquatic life, and riparian vegetation and wetlands. A series of improvements to the channel corridor are proposed as a comprehensive mitigation strategy for mitigation of effects and improvements to the Poudre River channel.

4.3.1 Stream Channel and Habitat Improvement Plan (AG-01)

Northern Water would provide funding for a stream channel and habitat improvement plan for the Poudre River from the Poudre Valley Canal to its mouth at the South Platte River. The stream channel and habitat improvement plan would address and mitigate Poudre River water related resources, including aquatic, stream morphology, water quality, riparian and special status species. The stream channel improvement plan will be developed as part of the adaptive management program (see section 4.3.5) in cooperation with CPW, City of Fort Collins, Town of Windsor, City of Greeley, and other interested parties, and incorporate the concepts and projects being planned and implemented by those entities.

Goals of the stream channel and habitat improvement plan would include:

- Collect additional data, perform a river corridor inventory, and document current conditions.
- Develop baseline geomorphic conditions for use in the Adaptive Management Plan.
- Develop a river-wide master plan and prioritization for maintaining and improving the following river functions:
    - Irrigation and municipal water supply diversions;
    - Channel and overbank capacity and connectivity;
    - Aquatic habitat and species;
    - Riparian habitat and wildlife species;
    - Flood risk to land and infrastructure;

- Recreation.

- Develop a long-term monitoring and maintenance plan.

- Ensure that a long-term funding and implementation group is in place to leverage funding provided by NISP with other governmental or grant funding that may be available to perform this type of work.

To the extent practical, the stream channel and habitat improvement plan would build upon data and analyses conducted for the EIS.

NISP commits to spending up to $1.0 million to develop the stream channel habitat and improvement plan. This funding is in addition to other commitments made in this Conceptual Mitigation Plan.

4.3.2 Channel and Habitat Improvements (AG-02)

As part of mitigation for resource effects throughout the Poudre River, Northern Water would implement improvements in the stream channel at two locations of approximately one mile each in affected reaches of the Poudre River. Initially, Northern Water has identified the following reaches for these improvements. The location and types of work that are funded by Northern Water would be verified with the stream channel habitat improvement plan and adjusted as necessary to be consistent with the plan.

- Approximately 1.2 miles within a 2.1 mile reach of the Poudre between PVC and the Hansen Supply Canal inflows (Figure 13)

- Approximately 1.2 miles of stream in the Watson Lake area (Figure 14)

Key components of a stream habitat improvement project would likely include constructing in-channel structures made of natural materials to create riffles and pools with a defined low-flow channel which would increase channel depth, especially during low-flows; reconnecting the channel to the floodplain and old oxbows; encouraging regeneration of native vegetation; and, removing areas of non-native vegetation. Providing better connectivity throughout the river is one key aspect that would likely be included in any plan to improve aquatic habitat. Improving connectivity through diversion structure bypass facilities is discussed in Section 4.3.3.

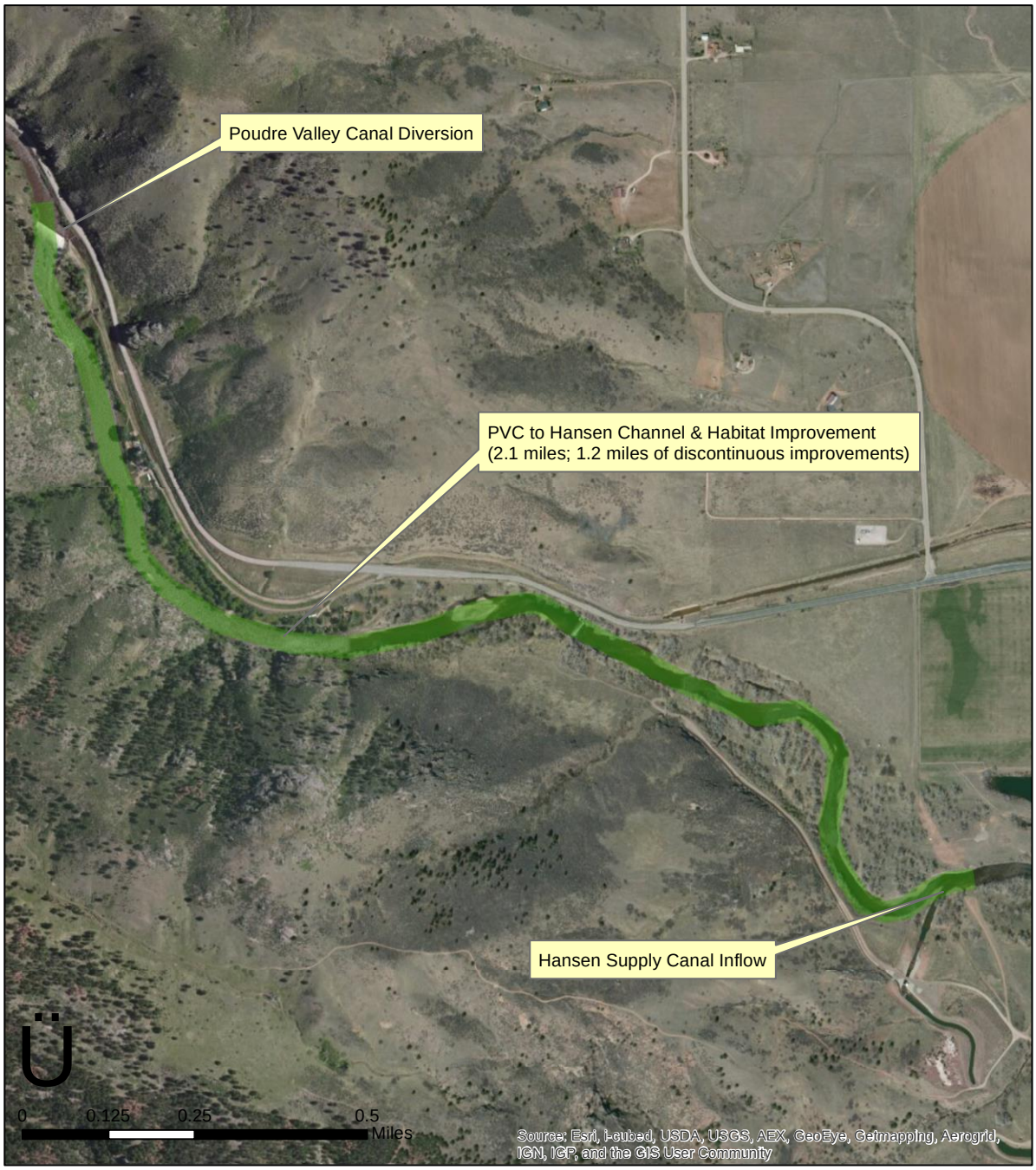

Figure 13. Poudre Valley Canal Mitigation Reach

Figure 14. Watson Lake Mitigation Reach

In addition to aquatic habitat and stream morphology effects, the PVC to Hansen Supply Canal reach is also intended to mitigate water quality effects, specifically temperature effects. This water quality effects analyses show that even under current conditions, this reach frequently exceeds coldwater temperature standards. With additional depletions from NISP within this reach, it is possible that there would be increased temperature standard excursions. Downstream of the Hansen Supply Canal inflows, temperature standard excursions are less problematic because Hansen Supply Canal inflows cool

downstream river water. Channel improvements in this reach would seek to narrow and deepen the current channel to be more consistent with current and future low-flow conditions and increase riparian vegetation, including larger plains cottonwoods that would shade the river channel. The effectiveness of these proposed improvements to cool water temperature would be verified during the detailed water quality modeling.

4.3.3 Multi-Objective Diversion Structure Retrofits (AG-05)

In order to mitigate potential effects of reduced aquatic habitat availability due to reduced flows in the Poudre River and to deliver and maximize benefits of low-flow releases, Northern Water would retrofit existing diversion structures with multi-objective diversion structure facilities at four existing diversion structures along the Poudre River. These locations were chosen because they are often dry-up points on the river, their locations are strategic to connecting longer reaches of river and riparian habitat, and their locations are required to administer provisions of this mitigation plan. Locations for these structures include:

- Watson Fish Hatchery Diversion
- Terry Lake Diversion
- Larimer-Weld Diversion
- Whitney and B.H. Eaton Diversions

Multi-objective diversion structures maintain the existing primary function of the structure to provide enough head in the river channel to make water diversions, while improving the function of the structure to convey low flows through the structure and provide for fish passage. Details of the exact methods for constructing and implementing a multi-objective diversion structures will be coordinated with CPW, and will be further developed in planning completed as described in Section 4.3.1.

Conveyance and measurement of low flows at these structures is critical to meet the goals and objectives of low flow commitments described in this mitigation plan. Specifically, measurement of low flow augmentation releases from Glade Reservoir (section 3.2.4) is required to ensure that these releases remain in the river through the entire reach described for that program. Measurement of flows that are less than or equal to the flows that result in diversion curtailment (sections 3.2.2) is required to administer the provisions of that program. The low flow bypass structures would be constructed in a manner that allows measurement within the structure, either through a flume, weir or a rated section.

Colorado Parks and Wildlife has developed concepts for constructing fish bypass structures at existing diversion structures, including retrofitting existing diversion dam structures with rock ramps, bypass channels, cross vane structures, and riffles, or replacement of the

existing diversion dam structure with a cross-vane drop, plunge pools, and or riffles constructed of rock (Figure 15). Existing diversion structures on South Boulder Creek have recently been retrofitted with these types of facilities (Figure 16). Colorado Parks and Wildlife has developed criteria for streamflow velocity and other physical characteristics of the structures to allow fish passage by native and sport fisheries (CPW 2014; CWCB 2014).

Reclamation has developed detailed design guidelines for the construction of rock ramps at diversion structures; the rock ramp consists of a low-flow channel designed to maintain biologically adequate depth and velocity conditions during periods of small discharges. The remainder of the ramp is designed to withstand and pass large flows with minimal structural damage. Fish passage facilities must consider the physical characteristics of the target species for all life stages (Reclamation 2007). Research is on-going regarding design details and implementation strategies to ensure that the installations maximize beneficial results, including research at a rock ramp bypass structure recently installed in South Boulder Creek near Boulder (Ficke et al. 2012).

In addition to those recommended by CPW, more traditional fish ladder designs may be appropriate for structures in the Poudre River. In response to the flood, two diversion structures on St. Vrain Creek were recently replaced with multi-objective diversion structures that include low-flow bypasses and fish passage features. The fish bypass features of these structures consist of concrete drop channels with removable v-notch weirs creating a stepped drop (Figure 17). The plates have orifices cut into the bottom. This configuration allows fish passage either through the orifice or over the v-notch weir. Diversion dams were constructed with a concrete upstream diversion wall with a grouted boulder drop structure downstream of the wall (previously seen in Figure 2). These structures are considered “non-hazardous to boaters” as the structures avoid steep drops and the grouted rip-rap drop features do not produce hydraulic jumps (more commonly referred to as rollers) on the downstream end.

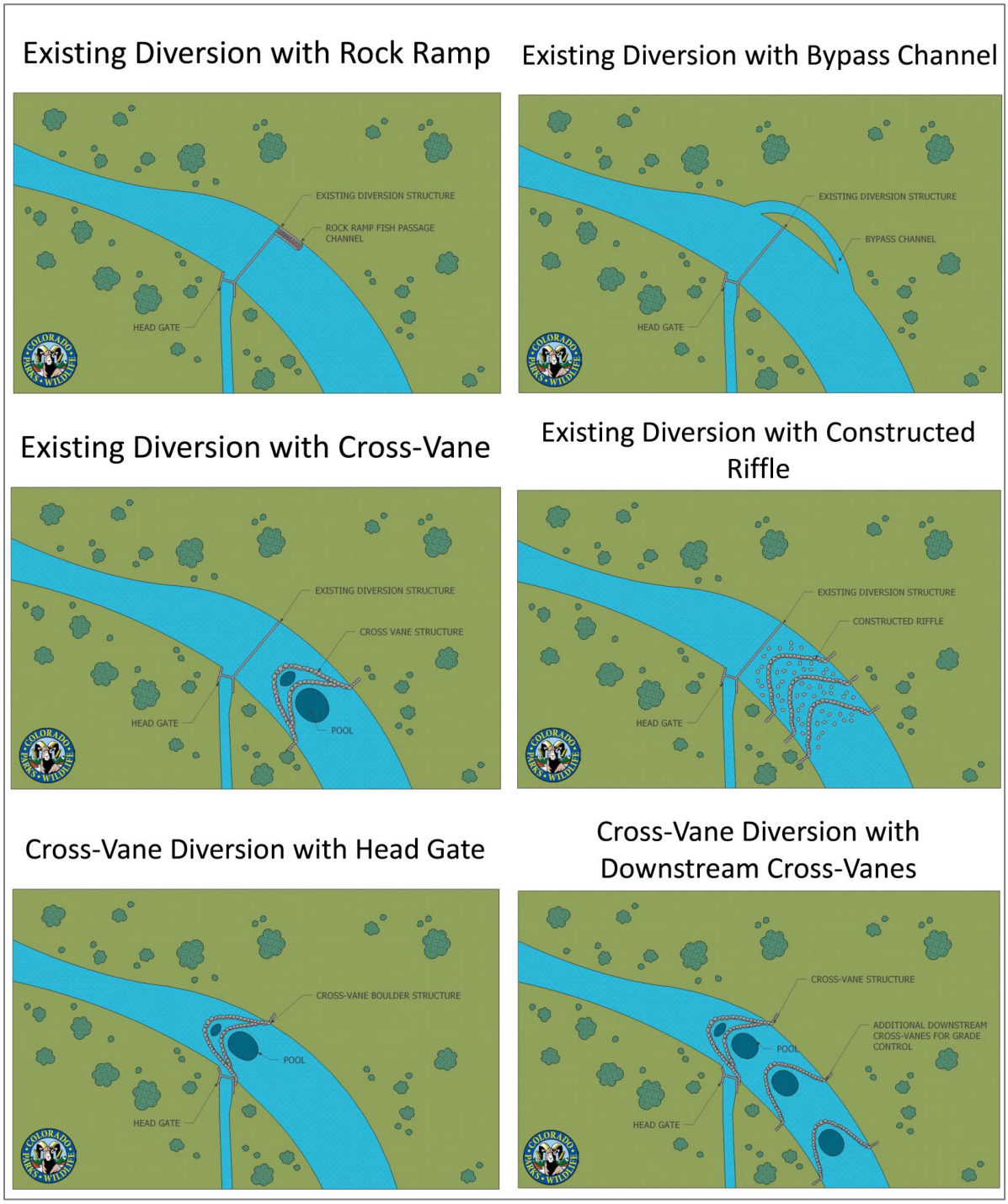

Figure 15. Conceptual Options for Fish Passage at Diversion Structures (CPW 2014)

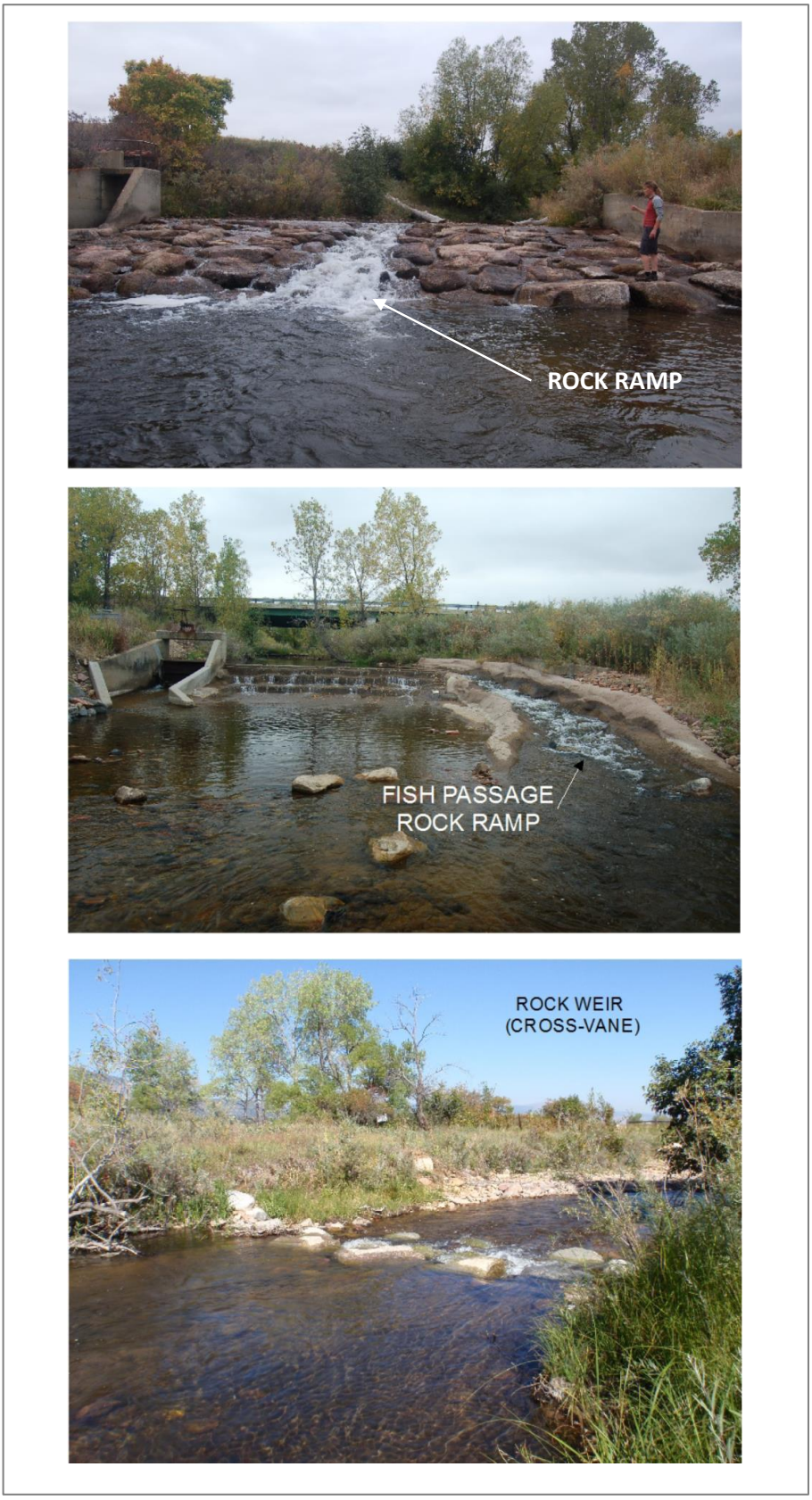

Figure 16. South Boulder Creek Diversion Structures (CPW 2014)

Figure 17. Oligarchy Diversion Fish Bypass Feature, Dewatered to Show Construction (left) and Fully Operational (Right)

The existing diversion structures for the Watson Lake Fish Hatchery (Figure 18) and Larimer-Weld Canal (Figure 19) incorporate traditional ogee crest diversion structures, while the Terry Lake Inlet incorporates a stepped concrete drop structure. At the Watson Lake Fish Hatchery, retrofitting the existing structure may require removal of a portion of the overflow crest for either a rock ramp or traditional fish ladder design because the opposite bank from the actual diversion (right bank in the photo) abuts a steep hill. Construction of the Watson Fish Hatchery and Terry Lake diversion bypass structures would connect 5.5 miles of aquatic habitat between the Larimer County Canal diversion structure near Ted's Place and Overland Trail. The Larimer & Weld diversion lengthens an existing 2.5 mile reach of the river to nearly 3.0 miles, with additional work currently planned by the City of Fort Collins lengthening that reach further. The Larimer-Weld diversion is currently scheduled for major repair and replacement work in the fall of 2014. Northern water has been in contact with the ditch company to ensure that designs are capable of accommodating multi-objective diversion structure facilities.

Figure 18. Existing Watson Lake Fish Hatchery Diversion

Figure 19. Existing Larimer-Weld Diversion Structure

The Whitney (Figure 20) and B.H. Eaton (Figure 21) diversion structures are located on the Poudre River in the southwest portion of Windsor approximately 800 feet apart (Figure 22). Both of these are typical irrigation diversion structures that do not have fish or boat passage installed. The Poudre Runs Through It group is currently investigating opportunities to address fish passage at these structures. One option being considered by the Poudre Runs Through It group is consolidation of these two diversion structures so that they both divert at the existing Whitney Diversion. The B.H. Eaton canal would be extended upstream to the new diversion location. This extension would likely require realignment of a portion of the existing bike path in this area. Alternatively, both diversions could remain, with both diversion receiving improvement to allow fish passage.

With either option, the diversion structure(s) would be retrofitted with a fish-friendly bypass facility. The bypass portion of this structure would be designed to target passage by smaller bodied native fish. This bypass structure(s) would connect a 3.8 mile reach upstream to the New Cache diversion structure with a 9.2 mile reach downstream to the Jones Ditch diversion structure, resulting in nearly 13 miles of connected habitat on the Poudre in this area.

Northern Water has had initial meetings and discussions with the key members of the Poudre Runs Through It working group regarding the project, and will continue to coordinate with the group. Additionally Northern Water has provided in-kind services to the project by performing topographic surveying of the site. Due to timing of project implementation, it is possible that the project may be fully developed and implemented before the NISP Record of Decision is issued. NISP would provide a portion of the funding for the selected project, not to exceed $200,000 in in-kind services and capital outlay, as long as the NEPA process and Record of Decision progress in a manner in which this project would be considered as NISP mitigation.

Design of the diversion structure bypass facilities would be done to maximize the benefits of the low flow augmentation program described in Section 3.2.4. This would likely require reshaping the channel upstream and downstream of the structure to create a defined low-flow channel in to and out of the bypass facility. This improvement would contribute to mitigating the loss of aquatic habitat in the lower part of the river due to changes in geomorphology in this part of the river.

Figure 20. Existing Whitney Ditch Diversion Structure

Figure 21. Existing B.H. Eaton Ditch Diversion Structure with Whitney Diversion in Background

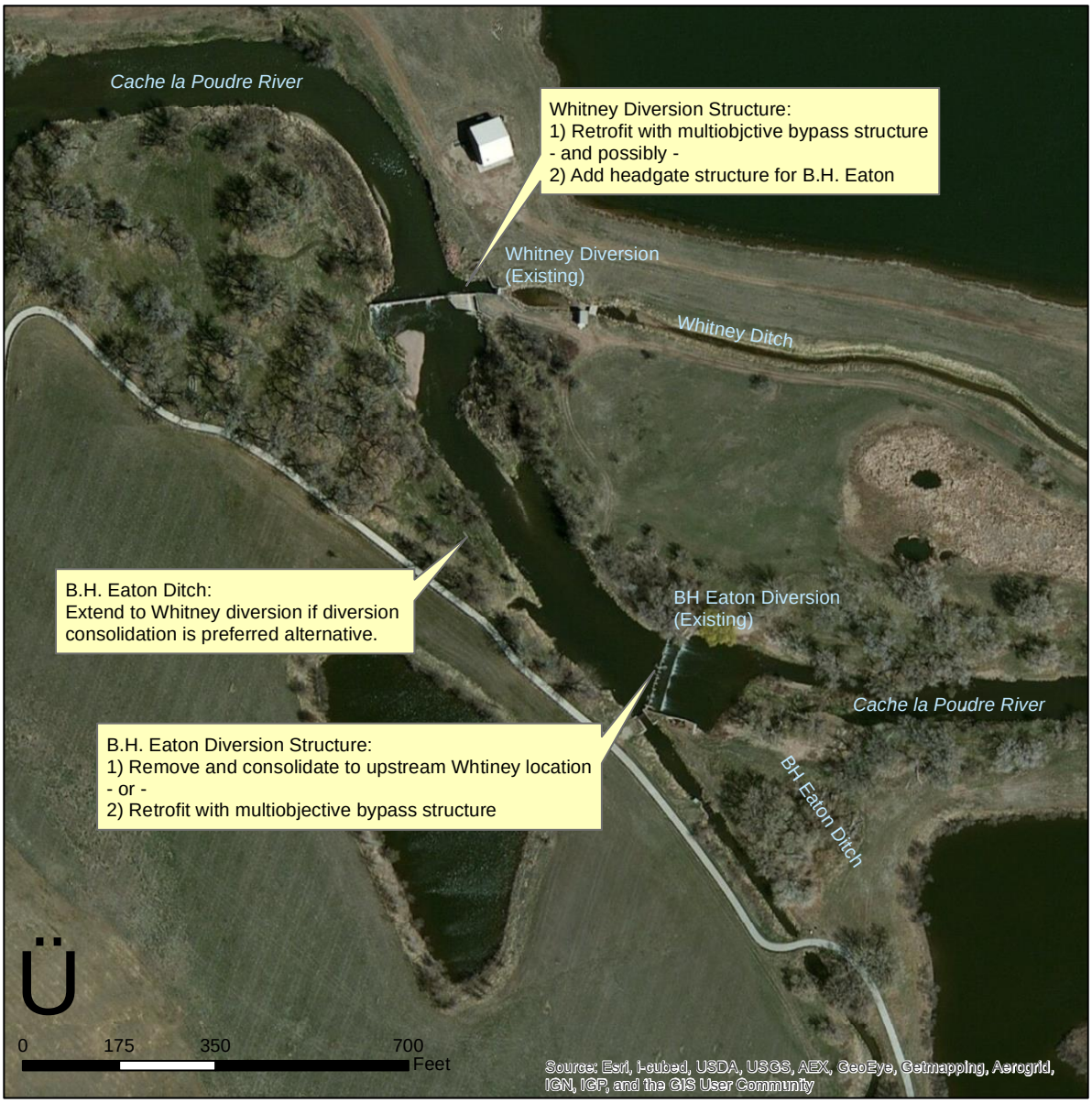

Figure 22. Whitney and B.H. Eaton Diversions

4.3.4 Riparian Vegetation Enhancements (RV-01, RV-02)

Improvements in riparian vegetation would be incorporated as part of all of the aquatic habitat restoration reaches that are described above. Additionally, Northern Water has identified additional areas to enhance riparian vegetation. Riparian vegetation enhancements would directly mitigate impacts on riparian vegetation resources, and would also mitigate effects on water temperature in certain reaches.

- City of Fort Collins (10 acres)
- Frank State Wildlife Area (34 acres)

- Eastman Park Area (14 acres)
- Adjacent to all channel improvement reaches (54 acres)

Riparian vegetation mitigation through Fort Collins will be coordinated with current planning efforts by the City, including its Poudre River Downtown Master Plan, which includes much of the nearly 5-mile reach of Segment B, in which approximately 10 acres of riparian vegetation may be affected by NISP. NISP would fund at least a compensatory amount of riparian vegetation improvements within this reach. Locations in the Poudre River Downtown Master Plan have been identified for riparian vegetation improvements at the Gustav Swanson Natural Area, a natural area east of Linden Street, and at a new 31-acre natural area north of the Mulberry Wastewater Treatment Plant (Fort Collins 2014a).

The Frank State Wildlife Area is located along the Poudre River on the west side of Windsor (Figure 23). This area has potential for expanding cottonwood woodlands, establishing riparian wetlands, and reconnecting and enhancing the oxbow to provide aquatic habitat and sediment storage. Non-native vegetation would also be removed. Two sites for potential riparian vegetation mitigation have been identified. The primary site is located on the west edge of the site near the parking area. The primary site currently is vegetated primarily by grassland, and is approximately 9 acres in size. The secondary site is located farther east. This site is 25 acres, but already has some mature cottonwood. The Frank State Wildlife area could be part of the stream enhancement mitigation for Segments E and F that is discussed in Section 4.3.1. The river reach through this area is approximately 1.2 miles long; only a portion of this reach, likely the west edge of the property along County Line Road adjacent to the riparian mitigation sites, would be included in this project. One key aspect of a channel improvement project conducted along with the riparian vegetation mitigation would be reconnecting the channel to the floodplain to ensure adequate water is available to sustain cottonwood growth and addressing channel capacity and providing opportunities for sediment storage.

Eastman Park is located along the Poudre River on the south side of Windsor (Figure 24). As with the Frank State Wildlife Area, this area has potential for expanding cottonwood woodlands and establishing riparian wetlands, but may not have as much opportunity to reconnect oxbows. Approximately 14 acres on the south side of the river have been identified for riparian mitigation improvements. Again, this project could be part of the stream enhancement mitigation for Segments E and F that is discussed in Section 4.3.1. This land is owned by the Town of Windsor. The river reach in this area is slightly less than one mile in length, but only a portion of the reach would be rehabilitated as part of the mitigation plan.

Northern Water has had initial conversations with the Town of Windsor regarding the applicability of these proposed improvements with its long-term vision for the river corridor. The town is currently updating planning in these areas, and feels that the proposed improvements, particularly in the Eastman Park area, are consistent with its overall vision for these corridors (Windsor 2014).

Opportunities for cottonwood regeneration would be incorporated into the approximately 2.4 miles of stream channel and habitat improvement reaches described in section 4.3.1. In order to fully mitigate the 112 acres of affected riparian and woodland shrubland, approximately 54 acres of regeneration areas would be developed, which results in an average developed riparian width along the improvement reaches of roughly 185 feet. Opportunities would be sought to locate these regeneration areas along reaches that would provide shading of the river channel to reduce water temperatures during low-flow summer time conditions. Results of the Phase II water quality modeling will provide additional information on the magnitude and timing of benefits that enhanced riparian areas, coupled with stream channel enhancements that are discussed in other portions of this plan, would have on stream temperature.

In cottonwood regeneration areas, the final grades and hydrology would be conducive to the establishment of a combination of cottonwood seedlings and planted trees. Cottonwood seedling areas would consist of gravely and sandy soils saturated during the early portion of the growing season. Surface water would be diverted to seedling areas until the root systems are developed enough to reach the ground water table.

Figure 23. Frank State Wildlife Area Proposed Mitigation Activities

Figure 24. Eastman Park Proposed Mitigation Activities

4.3.5 Poudre River Adaptive Management Program (AG-03)

Effects analyses performed by resource specialists show that the likely response of and changes to the Poudre River associated with NISP are anticipated to be within the historical range of changes that have occurred and continue to occur, making development of a detailed and quantitative mitigation plan for some Project effects difficult. Because of this, Northern Water proposes that maximizing benefits of NISP mitigation to river-based

resources would most effectively be guided by an adaptive management program implemented pursuant to the parameters outlined in this mitigation plan.

The initial steps for developing the adaptive management program would be assembling a broad but focused steering committee, and working with the committee to develop clear objectives for implementing the program within the resource commitments available for the program. This steering group would likely be comprised of representatives for NISP, Larimer County, Weld County, CPW, an environmental conservation organization, and the cities along the river. The steering committee would assist Northern Water in developing, evaluating and implementing the overall objectives and actions associated with the program.

The steering committee would provide guidance to Northern Water in developing the stream channel habitat and improvement plan (as described in Section 4.3.5) to prescribe a selection of mitigation actions for the Poudre River to address aspects of stream geomorphology, aquatic resources and riparian resources. Implementation of mitigation actions identified in the plan would be conducted in stages. The design and implementation of projects in later stages of the program may be adjusted based on the performance of initial projects. Development and implementation of the plan would require data collection, which has already begun through the EIS process, and would continue by Northern Water through the duration of the program.

As with any program of this nature, sideboards are required to ensure that it remains focused on its purposes and operates within its defined financial and resource constraints. Northern Water has developed the following set of conditions that would guide the program:

- The geographical boundaries of the NISP adaptive management program are the Poudre River from the Poudre Valley Canal diversion to its confluence with the South Platte east of Greeley;
- Resources include stream geomorphology, aquatic resources and riparian resources;
- Northern Water would consider NISP operational modifications only to a degree in which long-term project yield is not compromised and the operations fit within operations allowed by the NISP FEIS, Record of Decision and project water rights;
- Decisions on whether long-term project yield may be compromised by a particular operation and whether to implement a proposed operational modification would be made solely by Northern Water;

- Northern Water would make funding available for the program in the amounts described below to implement mitigation actions developed in the stream channel habitat and improvement plan;
- Funding and implementation of mitigation actions would take place throughout the program geographical boundaries.

Mitigation and enhancement measures enacted through this program may include, but are not limited to, the following:

- Accelerate establishment of channel forming by managing in-channel or riparian vegetation;
- Place structures to direct sediment to selected aggradation zones;
- Install check structures or weirs to control the inundation of riparian vegetation;
- Identify and install measures to reduce sediment inflow from point and non-point sediment sources;
- Place measures in areas subject to bed and bank erosion;
- Dredge or otherwise remove sediment from the channel mechanically;
- Perform additional stream channel habitat improvement;
- Regulate flows and utilize exchanges to promote the increase in water level to support adjacent riparian vegetation and other river attributes; and
- Make releases from Glade Reservoir consistent with the programs identified in this document to benefit aquatic habitat.

In addition to the other commitments made in this Conceptual Mitigation Plan, NISP commits to spend the following to establish, develop and implement the adaptive management program:

- $50,000 per year for the first 20 years of the Project to fund data collection, additional analysis and studies, and maintenance of the mitigation actions. It is possible that some of this funding may be “front-loaded” in the first years of the Program to initiate activities. This does not include Northern Water staff time for coordination of the program.
- $5.0 million set aside in an escrow account to implement actions developed in the stream channel habitat and improvement plan. Of this amount, $1.0 million would be used for projects identified in the Fort Collins Downtown Master Plan, or other planned activities by the City of Fort Collins on the Poudre River within the affected

reaches. These funds are separate from and in addition to funding required for any other part of this mitigation plan.

The adaptive management program would initially be developed by Northern Water and submitted to the Corps for review and approval at the time of the ROD. The steering group would be formed, inventory and data collection would be conducted, and the stream channel and habitat improvement plan would be developed and presented to the Corps during the design phase of the project. Northern Water would implement initial projects identified by the program prior to initial NISP diversions from the Poudre River. The program would continue for the first 20 years of NISP operations, or until the $5.0 million set aside for the program is exhausted, whichever comes first.

4.4 Water Quality

Water quality mitigation activities described in this section are those mitigation items that are designed to specifically target water quality mitigation. Other proposed water quality mitigation activities are described in other sections.

4.4.1 Glade Reservoir Water Quality Enlargement (FW-06)

Phase I of the water quality analysis shows that temperature standards are currently frequently exceeded during late summer in the cold-water reach upstream of Shields Street, particularly upstream of Hansen Supply Canal deliveries to the Poudre River, and states that NISP diversions could increase the magnitude and frequency of potential excursions in July and August. Water quality modeling being performed as part of the Phase II water quality evaluations will determine the extent to which NISP operations could exacerbate these excursions.

Northern Water evaluated the potential to curtail Poudre diversions to Glade during the late summer months to determine potential impact to the project yield using available CTP modeling datasets and runs. This modeling showed that enlargement of the reservoir from its current proposed capacity of 170,000 acre-feet to its full portion of the Grey Mountain water right of 192,500 acre-feet would be required to accommodate curtailment of late summer diversions (August and September) to benefit water quality while maintaining the full project yield. NISP components have been previously sized in order to provide a balance between the Grey Mountain water right and the SPWCP water rights. This modest increase in Glade storage would allow for less late-summer exchange with the SPWCP and added use of the Grey Mountain water right during spring runoff. For the current Glade Reservoir configuration, all of the later-summer diversions are due to ditch company exchanges, with the majority being with the Larimer and Weld Ditch. These late summer exchanges, while relatively small in volume, occur in nearly 70 percent of years.

The preliminary analysis shows that on average, April through July diversions would increase by approximately 4,000 acre-feet (9.3 percent), while August through September diversions would decrease by 3,700 acre-feet (or 100 percent). This would result in a streamflow decrease of 2.6 percent from that simulated for Alternative 2 from May through July, but would increase August through September streamflow by 16.6 percent and would avoid NISP diversions through the critical late summer months. May through July diversions would remain less than those simulated for Alternative 3 and would be within the range of effects analyzed in the SDEIS (Table 5 and Figure 25).

Table 5. Simulated NISP Diversions and Canyon Gage Streamflow

Simulated Alternative [2]	Diversions (ac-ft) [1]			Canyon Gage (ac-ft) [1]		
	Average Annual	Average April-July	Average Aug-Sep	Average Annual	Average April-July	Average Aug-Sep
Alternative 2, Run 3a (Glade Capacity = 170,000 af)	43,312	39,156	3,669	198,990	158,842	22,071
WQ Enlargement (Glade Capacity = 192,500 af)	43,707	43,165	0	198,595	154,833	25,740
Alternative 3, Run 3b1 (Cactus Hill Capacity = 190,000 af)	49,183	44,566	3,925	193,037	153,586	21,773

[1] Summary period WY 1980-2005

[2] Alternative 3 is presented to provide the upper range of diversions simulated in the SDEIS.

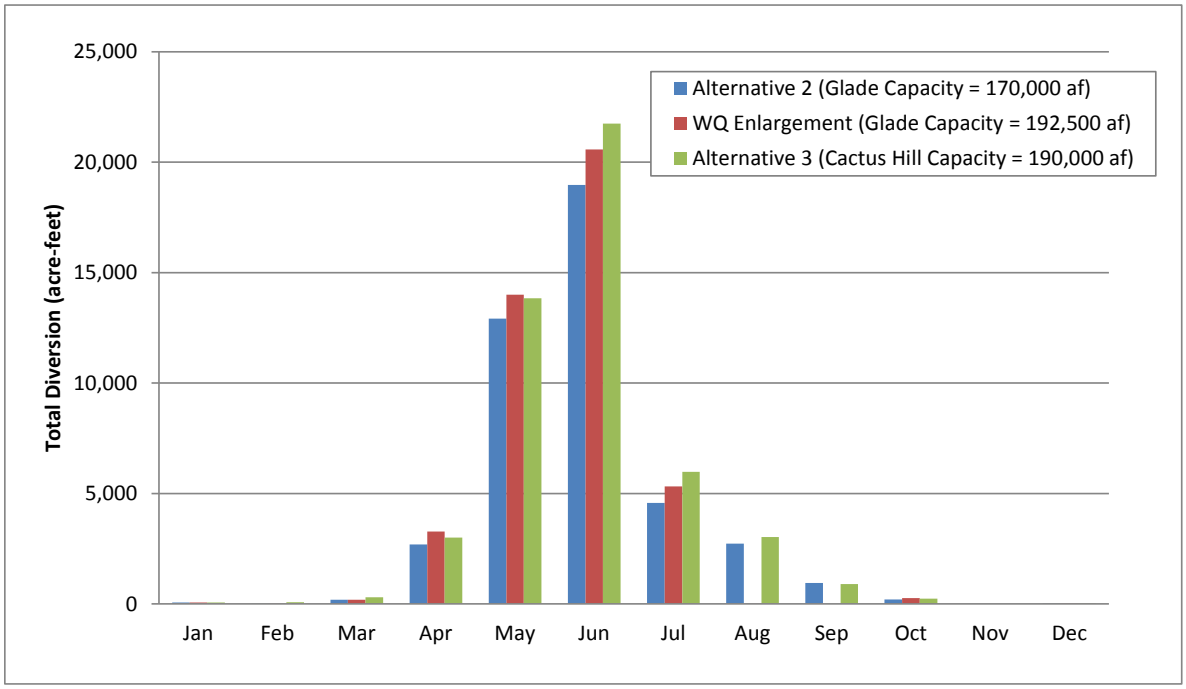

Figure 25. Simulated NISP Diversions for Current Alternative and Potential Water Quality Enlargement

An enlargement from the 170,000 acre-ft to 192,500 acre-ft would result an increase in maximum water surface elevation of 12 feet. Additional surface disturbance of the enlarged dam and reservoir would be marginal, and entirely contained within the current EIS study area.

Northern Water proposes to evaluate an increase in Glade storage to as much as 192,500 acre-feet to allow for operational flexibility during the late summer period. This would include the following tasks to be completed between the SDEIS and FEIS, so that the Corps permit decision can include a potential water quality enlargement of Glade Reservoir:

- Verification through the use of full CTP hydrology and modeling that an increase in storage can off-set the lack of diversion during late summer while still meeting full project yield.
- Integration of the detailed water quality modeling with the refined configuration and determination of potential operational strategies for mitigation of effects or environmental enhancement, including the evaluation of temperature thresholds above which NISP diversions may be curtailed.
- Validation by the third party contractor that no significant adverse environmental consequences are caused by either the enlargement of Glade or the change in inflow pattern.

As discussed above, the enlargement would be required to maintain project yield. The enlarged storage space would not create a new "pool" in the reservoir to be used for any type of release. Thus, the enlarged storage space would not be accounted for separately during project operations, and the stored water supply would be used to meet participant yield requirements.

4.4.2 Eaton Draw Wetlands (WQ-03)

As expected in a typical transition from a mountain river to plains river system along the Front Range, currently, water quality generally deteriorates in the Poudre River in a downstream direction. In Segment 12, which is the Poudre River downstream of Boxelder Creek (generally downstream of I-25), standard exceedances occur for total phosphorous, ammonia, total recoverable iron and dissolved selenium. Data for the South Platte shows standards exceedances for many of the same water quality parameters. The water quality effects analysis shows a minor to moderate effect of NISP on nutrients and inorganics/metals within segment 12 and the South Platte due to reductions in streamflow.

Eaton Draw is a tributary to the Poudre River that generally parallels Highway 85 from the north and conveys agricultural return flows and effluent from several treatment lagoons that discharge to the draw. Although additional data is needed to show with certainty, it is

thought that Eaton Draw contributes loading to this reach. Because Eaton Draw is a point discharge into the Poudre River, it offers an opportunity to provide a constructed wetland treatment area that could assist in reducing loading to the Poudre River from Eaton Draw for certain constituents.

To mitigate potential impacts of NISP on water quality in the lower reaches of the Poudre River, Northern Water would construct a wetland in Eaton Draw near the stream's confluence with the Poudre River near Greeley (Figure 26). Additional water quality and quantity data is required to properly size the wetlands to provide meaningful levels of water quality constituent reductions in the wetlands complex, but based on anecdotal data and information, it is estimated that the wetlands would be approximately 10 acres. The wetlands would be located near the mouth of the draw, near "O" Street and Highway 85 north of Greeley. The wetlands could be located on undeveloped land either west or east of the Highway (section 4.4.1). The site is not located near major residential areas.

The wetlands would be designed and constructed to remove key water quality constituents from Eaton Draw influent prior to this water being discharged into the Poudre River. Constructed wetlands are typically very effective at removing sediments and solids, moderately effective at removing nutrients, and good at removing total metals (Urban Drainage 2010). Excess nutrients, including nitrogen and phosphorous, are deposited into wetlands and often absorbed by wetland soils and taken up by plants and microorganisms (EPA 2004). However, phosphorous removal in wetlands is limited by plant uptake (EPA 1999). Additional data collection and wetland design would be required to determine the expected levels of phosphorous removal. Metals, including selenium, would be removed by the wetlands through sedimentation. Design of the constructed wetland would take into account this sedimentation by providing the ability to periodically remove the sediment from the wetland.

The constructed wetland would be designed and maintained to control mosquito populations.

The Eaton Draw constructed wetland site would serve as the compensatory wetland for Galeton Reservoir (0.3 acres). Additionally, this site could potentially serve as a wetlands mitigation bank for other incidental wetlands disturbance that may occur during pipeline construction (although currently, no permanent effects to wetlands from pipeline construction are anticipated). Northern Water will finalize these aspects of the constructed wetlands with the Corps prior to the FEIS.

Figure 26. Eaton Draw Constructed Wetlands General Location

4.4.3 Streamflow and Water Quality Monitoring (WQ-04)

Implementation of the low-flow bypass and augmentation programs and water quality mitigation described in both SECTION 3 and SECTION 4 would require development of a more extensive streamflow and water quality monitoring network in the Poudre Basin. Monitoring would be required at low-flow points in the Poudre River from the Canyon to its mouth near Greeley, and at inflow and outflow points of NISP facilities, including Glade Reservoir releases. The final monitoring plan will be coordinated with the Colorado

Division of Water Resources, Colorado Parks and Wildlife, and the Colorado Department of Public Health and the Environment through the section 401 certification process and the Colorado Fish and Wildlife Mitigation Plan. Northern Water would provide staffing and/or funding for installation and operations of the monitoring network.

4.4.3.1 Streamflow Monitoring

In order to provide additional data necessary to operate NISP and to meet the flow related commitments of this mitigation plan, Northern Water anticipates the need to install additional streamflow monitoring stations along the Poudre River and as part of NISP facilities.

- Poudre River upstream of the North Fork – The Poudre River mainstem currently is not gaged upstream of the Canyon Gage. The Colorado Division of Water Resources maintains a streamflow gage on the North Fork below Seaman Reservoir (State ID no. CLANSECO). At various times, the Poudre River mainstem has been gaged at several locations upstream of the North Fork, including the Rustic gage (CLARUSCO), the Log Cabin gage (CLALOGCO), and the Elkhorn Creek gage (CLAELKCO). The Elkhorn Creek gage is above the South Fork, while the Rustic and Log Cabin gage are upstream of the South Fork. Additionally, several sites have previously been gaged on the South Fork.

  Northern Water would work with the State of Colorado and other water users in the basin to identify a gaging site, or group of gaging sites, that can be used to monitor streamflow and have better predictive ability for streamflow that would occur at the Canyon gage.

- Poudre River at Shields Street – A gaging station is needed downstream of the Larimer and Weld diversion, as this location is often a dry-up point on the river, and is the location that the 10 cfs low flow augmentation program would be administered. There is already water quality monitoring performed at this site.

- NISP Operational Sites – A full range of gaging would be installed to operate NISP, including stations that monitor Glade Reservoir and Galeton Reservoir stage and storage contents, inflows, and releases. This operational data would be made publicly available.

In addition to these formal gaging station sites, the multi-objective diversion structure retrofits previously described in section 4.3.3 would have streamflow measurement capabilities in the low-flow portion of the structure.

Northern Water's field services program currently operates streamflow gaging stations in cooperation several agencies including the Bureau of Reclamation, Colorado Division of Water Resources, and U.S. Geological Survey. Northern Water would install and maintain

these gaging stations, and incorporate data into its water data storage system already developed and working conjunction with the systems operated by these agencies.

4.4.3.2 Water Quality Monitoring

Additional water quality monitoring would be performed to more fully characterize and understand the effects of NISP operations on Poudre River water quality before and after NISP project components are built and implemented, and to meet the water quality commitments of this Conceptual Mitigation Plan. Water quality monitoring would consist of an initial data collection effort, and long-term water quality monitoring:

- **Initial data collection** – Initial water quality data collection would focus on developing a baseline water quality dataset to verify water quality modeling assumptions and results. The water quality reports and modeling performed as part of the SDEIS, the FEIS and State 401 water quality certification process will determine the critical sites, constituents and frequency of the initial data collection effort. Data would be collected before NISP is operational, and for a period of years immediately after NISP is operational until water quality changes are validated.

- **Long-term monitoring** – The extent of long-term water quality monitoring would be based on that required to meet the specific requirements of this Conceptual Mitigation Plan, and those constituents and sites that the initial data collection effort identifies as necessary to monitor long-term water quality resulting from NISP operations.

Initial data collection would likely be required at sites on the mainstem of the Poudre River, tributary inflows, groundwater inflows, gravel pits, and agricultural point discharges to the Poudre River. Northern Water has identified potential sites for the initial data collection effort (Figure 27), which would be refined prior to initial data collection. Parameters assessed would include a subset of those in the GEI Water Quality Assessment Report (2015b) and/or in Northern Water's longitudinal analysis (Table 6). As is standard practice, the measurement of field parameters would be conducted at each site during each sampling event (temperature, dissolved oxygen, specific conductance, pH, and turbidity). Flow would be measured at all surface water sites where a gage value is not available. The final sites, parameter list, and frequency for the initial data collection effort will be determined between the SDEIS and FEIS based on the analyses and modeling being conducted for the FEIS and State 401 water quality certification process.

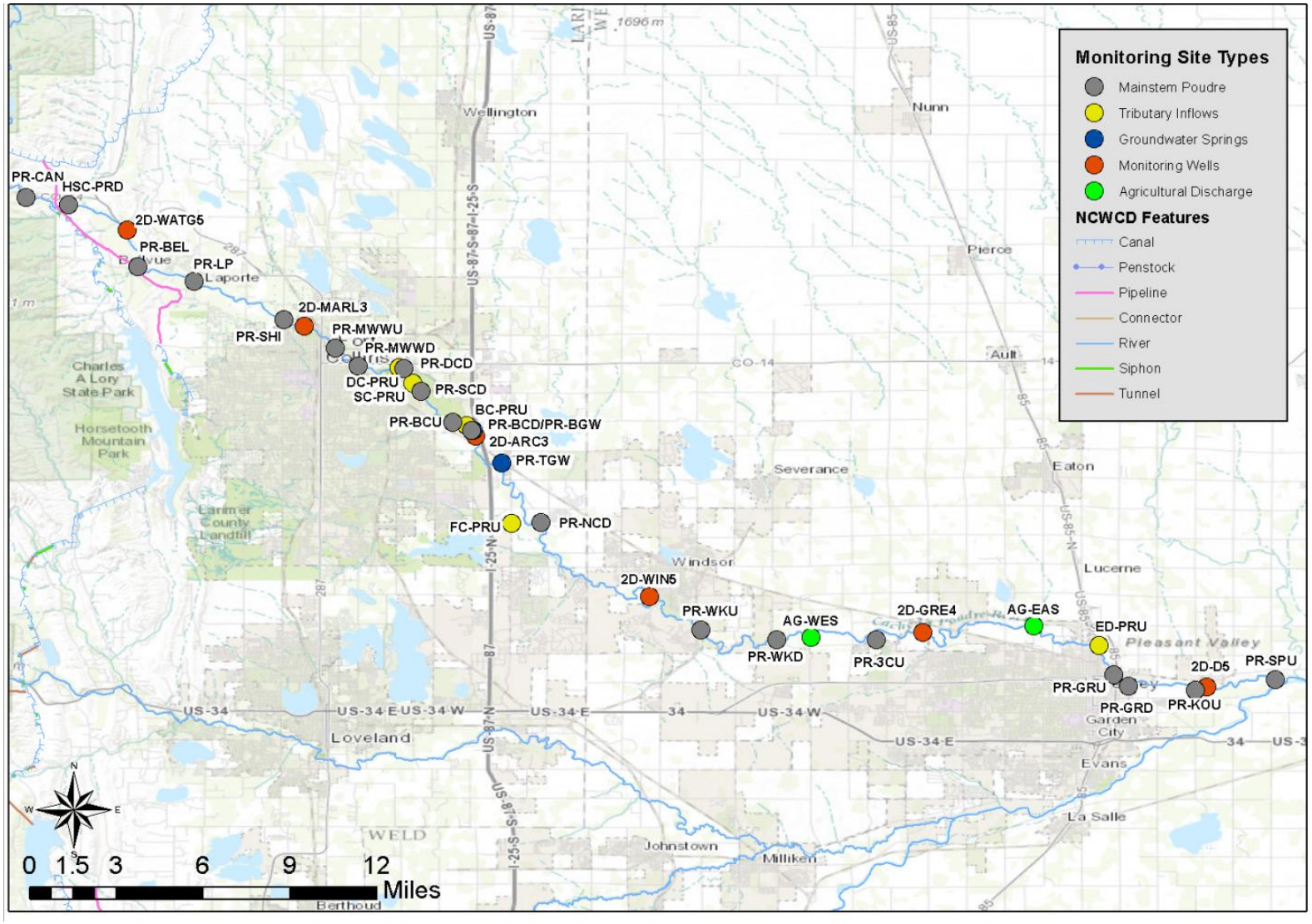

Figure 27. Potential Water Quality Monitoring Sites for Initial Data Collection

Table 6. List of Potential Water Quality Monitoring Parameters for Initial Data Collection

	Parameter	Potential Lab	Method	Method Detection Limit
Field Parameters	pH	--	YSI 6600 or 6820 multi-parameter sonde	
	Temp (°C)	--		
	Specific Conductance (µS/cm)	--		
	D.O. (mg/L)	--		
	Turbidity (ntu)	--		
	Flow (cfs)	--	Measured instantaneous, or flow gage	
	Water level (monitoring wells)	--		
General Parameters	Total Dissolved Solids (mg/L)	High Sierra	EPA 160.1	10
	Total Suspended Solids (mg/L)	High Sierra	EPA 160.2	0.1
	Hardness (mg/L as $CaCO_3$)	Huffman	Calculated from Ca & Mg	
	E. Coli (#/100 mL)	Industrial Laboratories		0/100 mL
Major Ions	Calcium (mg/L)	Huffman	EPA 200.7 (ICP-AES)	0.003
	Magnesium (mg/L)	Huffman	EPA 200.7 (ICP-AES)	0.001
	Chloride (mg/L)	Huffman	EPA 300.1 (Ion-exchange chromatography)	0.03
	Sulfate (mg/L)	Huffman		0.03
Nutrients	Total Phosphorus (mg/L)	High Sierra	EPA 365.3	0.001
	Nitrate + Nitrite (mg/L)	High Sierra	EPA 353.1 modified	0.001
	Ammonia (mg/L)	High Sierra	EPA 350.1 modified	0.001
	Total Kjeldahl Nitrogen (TKN) (mg/L)	High Sierra	EPA 351.2 modified	0.035
Metals	Copper, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02
	Iron, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.06
	Iron, total recoverable (µg/L)	Huffman	EPA 200.8 (ICP-MS)	1.8
	Manganese, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02
	Manganese, total recoverable (µg/L)	Huffman	EPA 200.8 (ICP-MS)	
	Selenium, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02

Based on commitments in this plan, real-time temperature data would be required upstream and downstream of NISP releases, both for the initial data collection effort and during long-term monitoring. Because the methods used to collect temperature data can also be used to collect other field parameters, it is likely that long-term monitoring would include those constituents. Long-term water quality monitoring sites, lab analyses and frequency of sampling events for other parameters would be based on parameters in the initial data collection effort that show sensitivity to NISP operations.

In addition to Poudre River and tributary sites, water quality data would continue to be collected as part of Northern Water's existing baseline water quality program in existing C-BT facilities, such as Carter Lake and Horsetooth Reservoir. Water quality monitoring in new NISP facilities, such as Glade Reservoir, Galeton Reservoir, and NISP releases to the Poudre River, would be incorporated into this long-term program. All water quality data

would be stored in Northern Water's existing water quality databases. Dissemination and reporting would be based on requirements in environmental permits issued for NISP.

Water Quality monitoring associated with operation of the SPWCP, primarily salinity monitoring of Galeton Reservoir deliveries and ditches, is described in section 4.8.1.

4.4.4 Coalition for the Poudre River Watershed (WQ-05)

Several resources, including geomorphology and water quality, are dependent upon protecting and controlling runoff in the upstream Poudre River watershed. The Coalition for the Poudre River Watershed was formed as a 501 (c)(3) non-profit corporation in 2013 following the 2012 High Park Fire. The overall mission is to "promote the improvement of the ecological health of the Poudre River watershed through the collaboration of a broad range of stakeholders." The short term work program of the CPRW focuses on post-fire management, while the long range work program includes pre-fire forest management within the watershed (Bassinger 2013). The watershed generally includes the entire Poudre River watershed above the canyon mouth, including adjacent areas in Rist Canyon, the upper Buckhorn area, and Laramie River watershed (Figure 28). The projected annual budget of the coalition is $100,000. This amount is currently divided evenly between the City of Fort Collins, City of Greeley, and Larimer County (Bassinger 2013).

In order to help protect source water quality for the Poudre River watershed and NISP, Northern Water would begin contributing annually to support the coalition's annual operating budget. At this time, it is unclear the exact contribution needed to provide this support. However, Northern Water proposes to match the contribution provided by the other agencies by contributing $35,000 annually, with adjustments allowed to account for inflationary increases.

If the Coalition for the Poudre River Watershed ceases to exist in the future, or changes its mission to be substantially different than its current mission, Northern Water would contribute to a non-profit organization with substantially the same mission as the current coalition. If that organization does not exist at that time, Northern Water would work with other Poudre Basin water suppliers to form that organization to carry out the mission currently being implemented by the coalition.

Activities conducted by the Coalition for the Poudre River Watershed could decrease sediment load in the Poudre River, reduce point and non-point source pollution, and improve channel and conveyance conditions in the Poudre River. These types of activities may decrease conveyance of sediment to lower portions of the Poudre River, improve ambient water quality concentrations including temperature in reaches upstream of those affected by NISP thereby improving downstream reaches, and improve the quality of water stored in Glade Reservoir.

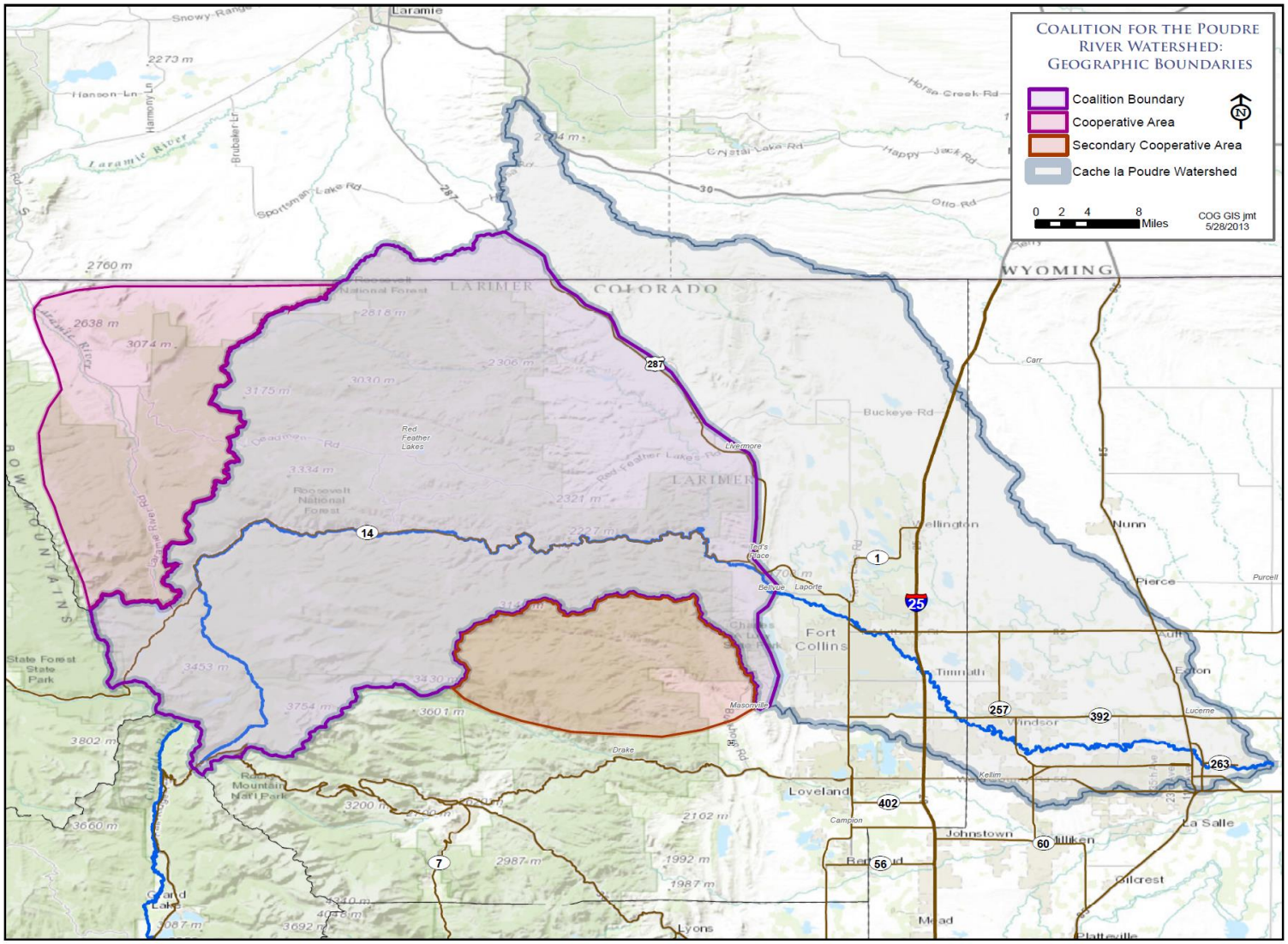

Figure 28. CPRW Watershed Map (CPRW 2015)

4.5 Fish and Wildlife Mitigation Activities

This section generally describes those fish and wildlife mitigation activities that are not associated with the Poudre River.

4.5.1 U.S. 287 Design (TW-01, TW-02)

With the western alignment selected for the reroute of U.S. 287, the gulch east of the ridge that would be cut would be spanned. The span would be designed in coordination with the CDOT and CPW, and would provide sufficient width and height to facilitate movements by big game underneath the highway.

Glade Reservoir may shift big game movements to the north of the reservoir, which could cause increased vehicle-wildlife collisions on U.S. 287 between the northern end of Glade Reservoir and the intersection of Owl Canyon Road and U.S. 287. Northern Water, CDOT, and CPW would monitor vehicle-wildlife collisions on this approximately 1.5-mile stretch of U.S. 287 for 5 years following highway realignment and reservoir construction. If in any year of monitoring the 10-year road kill average for this segment of road is exceeded by more than 10 percent, Northern Water would retrofit this segment of U.S. 287 with a wildlife underpass that would facilitate big game movements under the highway. The location and dimensions of the wildlife underpass will be coordinated with CDOT and CPW.

4.5.2 Deer and Elk Winter Range Conservation (TW-06, TW-07)

To compensate for the loss of about 2,050 acres of deer and/or elk winter range associated with the construction of Glade Reservoir, its forebay and the realignment of U.S. 287, Northern Water would conserve land it already owns surrounding Glade Reservoir as big game habitat. Northern Water is in discussions with Larimer County and CPW to discuss options for allowing public access to the west side of the reservoir, including potential trail systems, without disrupting big game habitat and migration patterns.

Additionally, Northern Water commits to providing $1,000,000 for preservation of big game habitat and migration corridors regionally through fee purchase, securing conservation easements, or other type of land conservation method. Northern Water would work with CPW, Larimer County, Weld County, conservation groups, and land trusts to identify potential properties, secure additional matching funds if necessary, and execute transactions.

4.5.3 Galeton Reservoir Fishery (AG-08, AG-09)

NISP would make Galeton Reservoir available to CPW for raising native warmwater fish for reintroduction into the Poudre River or other locations. Galeton Reservoir may periodically go dry and Northern Water cannot guarantee a permanent water supply for raising the native fish. These reintroductions would likely be done in isolated, off-channel habitats, such as backwater and floodplain pools, that give these species protection from

nonnative species that would eat or out-compete native fish. Over time, the native species may escape from these areas and recolonize the Poudre River.

Northern Water would install and maintain, at its cost, fish screens on the inlet and outlet of Galeton reservoir and the SPWCP forebay pump station to prevent introduction of non-native predatory species into the reservoir. Northern Water will coordinate with CPW on the design of the fish screens.

4.6 Recreation and Public Access

Recreation and public access mitigation activities describe those recreational commitments other than flow-related commitments previously described in section 3.2 and other Poudre River restoration commitments described in section 4.3.

4.6.1 Glade Reservoir Recreation (RC-01, RC-02, RC-07)

Northern Water would seek a qualified vendor or lessee (e.g., Larimer County or Colorado State Parks) to develop a recreation plan and manage recreation at Glade Reservoir (including the forebay). Northern Water would fund development of the recreation plan and Northern Water's approval of the plan would be required prior to its implementation, the recreation plan would be approved by Northern Water. It is expected that the recreation plan would be similar to the types of recreation currently occurring at Horsetooth Reservoir and Carter Lake. Larimer County Department of Natural Resources has expressed an initial interest in management of recreation at Glade Reservoir. Recreational opportunities would likely be similar to those at Horsetooth Reservoir and Carter Lake, including motorized boating on Glade Reservoir, and a developed campground.

Glade Reservoir would block the current hunter access to State Trust lands and the national forest west of the proposed reservoir site. Northern Water will coordinate with CPW to provide comparable alternative hunter access to the State Trust lands and national forest. Additionally, Northern Water would work with CPW and Larimer County to allow limited hunting access on property owned by Northern Water adjacent to the reservoir.

Northern Water would construct a Visitor's Center at the Glade Reservoir complex. The Visitor's Center would include displays and information on project operations, geology, conservation, preserving irrigated lands, and environmental commitments of the Project. Northern Water will coordinate with the Poudre Heritage Alliance to incorporate displays on the Cache la Poudre River National Heritage Area.

4.6.2 Glade Reservoir Fishery (AG-06)

Based on available hydrology and reservoir operations, Glade Reservoir would be full or nearly full in approximately half of the years. The reservoir would fill in spring and early summer and be drawn down through the summer and fall. During drought periods, the

reservoir would not fill for several consecutive years. Typically, drought periods would cause the reservoir to be substantially less than full for periods of three to four consecutive years although this could extend up to nine years in a severe drought as described in the NISP Proposed Operations Plan (CDM Smith 2014a). The reservoir would be suitable to support both coldwater and warmwater recreationally important fish species. The reservoir would provide new habitat to sustain populations of a variety of organisms. The reservoir would also be suitable for the establishment and management of a recreational fishery that could support populations of both stocked and self-sustaining fish species. Results of a reservoir fishery productivity model indicate that the Glade Reservoir fishery would support a fair recreational fishery (GEI 2015a).

The SDEIS water quality analysis indicates that fish consumption advisories are likely at Glade Reservoir due to the bioaccumulation of mercury in fish tissues. Site specific fish consumption advisories are currently in place for Carter Lake and Horsetooth Reservoir, as well as numerous other lakes and reservoirs in Colorado, for certain fish species (Colorado Department Public Health and Environment 2015). Northern Water commits to working with and providing funding to Colorado Parks and Wildlife to manage the fishery at Glade Reservoir to minimize the likelihood that a site specific fish consumption advisory would be issued.

Details of management strategies and funding levels will be coordinated with Colorado Parks and Wildlife during the state fish and wildlife mitigation planning process (section 1.4.4.1). Potential management options may include:

- **Sport fish management** – Site specific consumption advisories are much less likely for non-predatory fish such as rainbow trout, crappie and perch than for larger predatory fish such as walleye and lake trout. Fish consumption advisories at Horsetooth Reservoir are for Smallmouth Bass, Walleye and Wiper, while fish consumption advisories at Carter Lake are for Walleye only. Management of fisheries at Glade Reservoir could target smaller predatory species that are less likely to have mercury bioaccumulation issues.

- **Prey fish stocking** – Colorado State University and Colorado Parks and Wildlife have studied management opportunities to reduce bioaccumulation of mercury in fish tissue, specifically walleye in Horsetooth Reservoir. This study found that stocking smaller prey fish for consumption by predator fish may reduce mercury accumulation in the predator fish (Johnson et al. 2015).

Northern Water would install and maintain fish screens on the inlet and outlet for Glade reservoir to reduce the likelihood of fish migration into and out of the reservoir. The design of the fish screens will be coordinated with CPW.

4.6.3 Parking for Poudre River Recreators (RC-06)

Discussions with and comments by commercial outfitters on the Poudre River indicate a desire to have large scale parking available near the mouth of the Poudre Canyon to provide a meeting area for large groups of people, primarily for those participating in non-commercial rafting trips and other recreational activities, to carpool to those activities and relieve traffic congestion in the canyon.

Northern Water owns land in the area immediately north of Ted's Place and south of the Glade Reservoir Dam that could be used for this purpose. Although the exact layout of appurtenant facilities in the Glade Reservoir complex, including access roads and parking areas, has not yet been finalized, Northern Water would commit to constructing a parking area for this purpose. The parking area would be located within ½ mile of Ted's place to increase drive-by traffic at Ted's Place businesses, with daily parking allowed at a reduced rate from the fees being charged by the managing agency for recreational access to Glade Reservoir and the forebay. The parking area would have a capacity of 100-200 cars.

4.6.4 Mitani-Tokuyasu State Wildlife Area (RC-04, RC-05)

The SPWCP diversion, forebay and pump station would occupy much of the land that is currently leased by CPW for the Mitani-Tokuyasu SWA (Figure 29). To mitigate these impacts, the SPWCP pump station and forebay would be designed and operated as to continue allowing public access to the Mitani-Tokuyasu State Wildlife Area. Additionally, NISP would provide substitute facilities comparable to any existing facilities that would be lost at the State Wildlife Area due to construction and operation of the SPWCP. At this time, the only facilities known to need replacement are public parking and a portion of the access road.

Additionally, Northern Water agrees to allow public fishing and hunting access at the SPWCP forebay reservoir. Facilities would be designed to accommodate public access to those portions of the forebay that do not pose safety or security concerns. At times when the SPWCP is pumping during the winter, it is likely that the water surface would remain at least partially ice free, allowing opportunities for waterfowl hunting.

Northern Water will coordinate with CPW regarding impacts to the State Wildlife Area. The proposed replacement facilities and public access plan would require approval by CPW.

Figure 29. SPWCP Diversion Facilities (GEI 2006) and Mitani-Tokuyasu SWA

4.7 Cultural Resources

Cultural resources would be mitigated through development and implementation of a programmatic agreement with the Colorado State Historic Preservation Office.

4.7.1 Programmatic Agreement (CR-01)

The Corps, the Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation would enter into a Programmatic Agreement (PA). The PA would set forth how cultural resources would be addressed for NISP. Any permit from the Corps would incorporate the provisions of the PA. Northern Water and its contractors would follow and implement the stipulations listed on the PA.

4.7.2 Class III Surveys (CR-02)

Northern Water would perform Class III cultural resource surveys for all facilities to be constructed for NISP. The surveys for the reservoir forebays and diversions must be completed prior to the Corps issuing a permit. Surveys for pipelines must be completed as part of final design and prior to any construction.

4.7.3 Treatment (CR-03)

Northern Water would avoid properties eligible for inclusion in the NRHP through design of project facilities, relocation of project facilities, or by other means to the extent practicable. If avoidance is not feasible or prudent, Northern Water shall develop, in consultation with the parties to the PA, an appropriate treatment plan designed to lessen or mitigate project-related effects to the targeted historic properties. The draft treatment plan shall be submitted to the Corps by Northern Water. For properties eligible under Criteria A through D (36 CFR Part 60.4), alternative forms of mitigation may be negotiated with the appropriate parties to the PA in lieu of, or in addition to, data recovery (e.g., monitoring, *in situ* protection, archival research).

When archeological data recovery is the preferred treatment option for an eligible property or properties, Northern Water will develop a plan for the recovery of archeological data based on an appropriate research design. The research design shall be developed after all appropriate cultural resources inventory and evaluation work is completed. Data recovery plans shall be consistent with the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (48FR44716.37) and shall be implemented prior to any ground disturbance in the vicinity of the historic property(ies).

Discovery Situations. When cultural resources not previously identified are discovered during ground-disturbing activities, or when a previously identified historic property is affected in an unanticipated (accidental) manner, all activities within 100 feet of the discovery shall cease immediately and Northern Water shall notify either the Corps' Field Office or the District Office. The Corps would ensure that the discovery is evaluated and recorded by a professional archeologist, as defined in the PA.

Reporting. Northern Water would submit to the Corps an annual report by December 1 of each year the PA is in force. The annual report would summarize the actions taken the previous year under the PA.

4.8 Socioeconomics

Socioeconomic commitments mitigate adverse socioeconomic effects, primarily associated with potential loss of yield for sensitive crops during certain SPWCP operating conditions. Mitigation of other socioeconomic effects are described in other sections, including effects

on boating recreational values and nonuse values (sections 3.2, 4.3, and 4.6), effects on flood risks downstream of I-25 (section 4.3), and effects on private businesses in the Ted's Place area (section 4.6).

4.8.1 SPWCP Crop Yield Monitoring (SE-01)

The delivery of water from the SPWCP to the Larimer-Weld and New Cache canals may increase the salinity of irrigation water delivered to farms downstream of the introduction points. Such increases may affect crop yields for certain crops under certain conditions. Northern Water has commissioned studies to determine potential impacts on crop yields from SPWCP operations (Hoffman 2012). The studies have concluded that there is no expected loss in yield during normal operations and climatic conditions. Under worst case conditions of a high proportion of SPWCP water to canal water or extreme drought conditions, some losses may occur in bean, carrot and onion crops.

Northern Water would continue to work with the ditch companies to determine both instantaneous and long-term blending ratios that significantly reduce the potential for crop yield reduction that could be caused by the SPWCP. This work would include continued monitoring of water quality in canals and deliveries to fields, conducting periodic soil sampling to ensure salinity and boron are not becoming excessive and sodium-adsorption-ratio values are not causing a reduction in water penetration or drainage, and working with ditch companies on the timing and locations of SPWCP deliveries.

4.8.2 Ditch Company Delivery Augmentation (SE-02)

Reductions in crop-yield due to decreased water quality from deliveries by Galeton Reservoir under a worst-case scenario could result in a regional economic loss to the farming economy. Because both the Larimer-Weld and New Cache canal systems tend to be water short systems (i.e. in most years, the amount of water available for diversion and diverted by the canal systems is less than the full demand for crops), and because crop yield is a function of, among other factors, the amount of water delivered to the crop, it may be possible to mitigate regional economic losses by supplying the ditch companies with additional water to increase yields on more salt tolerant crops.

Northern Water will investigate opportunities to augment ditch company diversions to compensate for potential losses in crop yield. Investigations will include identifying the sources of the additional water, the amount of water needed to compensate for crop loss, and the timing and delivery of this water. Potential sources for the water may include:

- Additional deliveries from Galeton Reservoir that would not be exchanged into Glade Reservoir
- Releases (including possible pumping) of NISP water stored in in-system reservoirs (such as Terry Lake, Big Windsor or Timnath Reservoir)

- Releases from storage in Glade Reservoir
- Delivery of SPWCP reusable return flows

4.9 Other

The following activities mitigate effects of energy use and greenhouse gases, and land use. Mitigation of emissions from construction equipment is discussed in mitigation measure GC-01: Typical Design and Construction BMPs (section 3.3.1).

4.9.1 System Efficiency and In-System Small Hydropower Opportunities (EG-01)

The primary energy consuming components of NISP infrastructure are pumps that convey water from the Glade Reservoir Forebay to Glade Reservoir, and the Pumps that convey water from the SPWCP Forebay to Galeton Reservoir. Northern Water would select pumping components that maximize pumping system efficiency. Opportunities for maximizing system efficiency may include selecting the proper pumps that would typically operate at or near their best efficiency point, monitoring pumps and pumping operation to avoid cavitation, avoiding operations near minimum flow points, selecting pumps that utilize high-end bearing materials, and performing proper maintenance of pump components (Department of Energy 2006).

Northern Water would also investigate opportunities to develop small-scale hydropower facilities within NISP infrastructure. Opportunities may include configuring pumps at the Glade Reservoir Forebay pump station to operate in reverse direction to generate power, or installation of small hydropower systems at the discharge points of pipelines. Northern Water has recently installed the Robert V. Trout Hydropower Plant at Carter Lake, and is currently planning at hydropower plant at Lake Granby, both under the Bureau of Reclamation's Lease of Power Privilege process. These types of projects show Northern Water's ability to identify, implement, and operate hydropower opportunities within its facilities.

4.9.2 Relocate and/or Compensate Residences (LU-01)

Current site topography suggests that three residences could be impacted by the reservoir inundation pool, all located at the north end of the reservoir pool. As part of the design process, site topography is currently being refined. Elevation of the reservoir inundation pool and the structures will be checked with the new site topography to verify whether the structures would be inundated.

Assuming current site topography is reasonably accurate, one private residence on the west side of the reservoir pool would be inundated, and one private residence on the east side of the reservoir pool would be located within 500 feet of the higher water line. Northern Water has been in contact with landowners and discussed options for their

respective residences. The landowner on the west side of the reservoir would have the option of having their residence and associated buildings relocated on the existing property at the cost of Northern Water, or being appropriately compensated for removal of the buildings. The landowner on the east side of the reservoir would also have relocation or compensation options, as well as an option for Northern Water to construct a new access road to the residence along the east side of the reservoir. Northern Water will continue discussions with these landowners and negotiate an appropriate form of compensation.

Additionally, one residence owned by Northern Water would also be inundated. Northern Water would remove this residence and associated outbuildings. This residence is currently being leased under terms which state that Northern Water would provide adequate notice to the lessees upon Northern Water's desire to terminate the lease.

SECTION 5. IMPLEMENTATION SCHEDULE

The mitigation schedule will be contingent on the issuance of permits and licenses, construction timetables, project completion, and the ability to fill the reservoir. The timing of activities provided in Table 7 provides a general summary of the implementation schedule on a broad-level basis. The schedule will be refined as further detail is developed on the Project and associated mitigation plan.

Table 7. Conceptual Mitigation Timing of Activities

Activity and Timing	Mitigation Items Covered
U.S. 287 Relocation – Design/Pre-Construction	
Incorporate project features and design BMPs into project design; features will become a permanent part of the highway realignment.	GC-04, TW-01
Coordinate U.S. 287 construction activities with CDOT, including paleontological and intelligent transportation technologies.	CR-04, GC-05
U.S. 287 Relocation – Construction	
Make construction BMPs, commitments and compensation measure part of construction specification documents, and implement and monitor these measures during construction, including general construction and stormwater practices, paleontological monitoring, and special status species monitoring.	CR-05, GC-01, GC-02, GC-03, SS (monitoring)
U.S. 287 Relocation – Post-construction	
Monitor effectiveness of wildlife BMPs and retrofit underpass if required.	TW-02
Prior to FEIS and Record of Decision	
Further analyze feasibility and finalize flow programs that require additional study, including flow augmentation protection, and water quality enlargement of Glade Reservoir.	FW-05, FW-06,
Immediately commence discussions with state agencies and water users regarding ramping deliveries of C-BT water.	FW-07
NISP Project Design	
Incorporate project features and design BMPs into project design; design features will become a permanent part of the project.	AG-04, AG-07, AG-09, EG-01, GC-04, RC-04, RC-06, RC-07, WQ-02
Incorporate access to recreational opportunities at Glade Reservoir into design. Access to public land will be constructed in conjunction with U.S. 287 relocation, and access maintained as reasonable during construction activities.	RC-02, RC-03
Incorporate wetlands and Preble's habitat into Glade Reservoir design. Schedule will be coordinated so that the lag time between wetland creation and existing wetland disturbance is minimized.	SS-01, WL-01, WL-02
Establish an organizational structure and develop stream channel and habitat improvement plan. Adjust other stream related mitigation activities as needed to fit within stream channel and habitat improvement plan (within the general scope of activities and intent described herein).	AG-01
NISP Pre-Construction	
Finalize the draft Cultural Resources Programmatic Agreement and Air Quality plan/permits with appropriate agencies prior to discussion.	AQ-01, CR-01, CR-02
Prepare sites for construction, including relocation of residences, special status species surveys, marking of habitat, and TCE plume remedial actions.	HZ-01, HZ-02, LU-01, SS (surveys), TW-03

Activity and Timing	Mitigation Items Covered
NISP Project Construction	
Make construction BMPs, commitments and compensation measures part of construction specification documents, and implement and monitor these measures during construction, including cultural resources programmatic agreement, general construction and stormwater practices, noxious weed plan, special status species and wildlife species protection, and visual resource mitigation.	CR-03, GC-01, GC-02, NW-01, SS (avoidance, protection, compensation), TW-04, TW-05, TW-06, VS-01
NISP Project Operations	
Operate NISP facilities according to flow commitments described herein, including avoiding NISP diversions at Munroe Canal, curtailing NISP diversions for summer and winter flow commitments, and releasing water from Glade Reservoir to maintain flows during winter.	FW-01, FW-02, FW-03, FW-04
Discuss with ditch companies and implement mitigation measures for potential crop yield loss during project operations.	SE-01, SE-02
Develop and implement enhanced streamflow gaging and water quality monitoring program. Make adjustments to water quality monitoring program based upon analysis of initial data collection efforts.	WQ-04
Establish management organization(s), develop plans, monitor, mitigate and make adjustments to operations for water quality and adaptive management plan.	AG-03, WQ-01
NISP Non-Project Improvements	
Begin planning and design immediately following issuance of a permit by the Corps, and construct non-Project features prior to commencement of NISP operations, including channel enhancements, multi-objective diversion structures, parking area, riparian improvements, and off-site wetlands.	AG-02, AG-05, RV-01, RV-02, WQ-03
Coordinate and provide funding for activities to be completed by other agencies, including fishery commitments, recreational management and planning, and wildlife habitat commitments.	AG-06, AG-08, RC-01, RC-05, TW-07
Construct replacement facilities that will be in-place prior to initiation of construction activities as feasible.	RC-04
Provide on-going annual payments through the life of the project to the Coalition for the Poudre River Watershed and SPWRAP.	WQ-05, SS-05

SECTION 6. REFERENCES

Anderson Consulting Engineers. 2014. Stream Morphology and Sediment Transport Cache la Poudre River Mainstem Final Project Effects Report, Volumes I and II. In support of: Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. Fort Collins, CO. August 15.

Bassinger, Suzanne. 2013. White paper, objective: Approve Larimer County funding support of the non-profit Coalition for the Poudre River Watershed. Prepared for Larimer County Board of County Commissioners. Larimer County Recovery Manager. August 27. Available at: http://www.poudrewatershed.org/

Baylar, Ahmet, M. Emin Emiroglu, and Tamer Bagatur. 2009. Influence of Chute Slope on Oxygen Content in Stepped Waterways. Gazi University Journal of Science, Ankara, Turkey. Available at: http://www.gujs.gazi.edu.tr/index.php/GUJS/article/viewFile/159/87

BBC Research, Inc. and Honey Creek Resources (BBC and HCR). 2015. Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement Socioeconomic Effects Technical Report. February.

Black & Veatch. 2008. Memorandum to Carl Brouwer, Northern Colorado Water Conservancy District from Howard Andrews & Chris Tadanier, subject: Total Organic Carbon Issues. B&V Project 163268. December 23.

California State Water Resources Control Board (California). 2014. Non-Point Sources Program Encyclopedia, Section 5.1C – Stream Channel Modification – Dams and Levees, Operation and Maintenance. Accessed August 6. Available at: http://www.waterboards.ca.gov/water_issues/programs/nps/encyclopedia/5.1c_chnlmod_damopmntnt.shtml.

CDM Smith. 2014a. Final Draft Report, Operations Plan Report, Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. Prepared for the U.S. Army Corps of Engineers, Omaha District, Denver Regulatory Office. August.

CDM Smith. 2014b. Water Resources Technical Report, Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. Prepared for the U.S. Army Corps of Engineers, Omaha District, Denver Regulatory Office. January.

Colorado Department of Public Health and Environment. 2014. State of Colorado Water Quality Certification Fulfilling the Requirements of Clean Water Act Section 401 Factsheet. Water Quality Control Division. Downloaded July 10. Available at: https://www.colorado.gov/pacific/cdphe/401-certification

Colorado Department of Public Health and Environment. 2015. Website: Fish Consumption. Access April 9. https://www.colorado.gov/pacific/cdphe/wq-fish-consumption.

Colorado Department of Transportation (CDOT). 2005. Impacted Black-tailed Prairie Dog Policy. Memorandum. June 1.

Colorado Parks and Wildlife (CPW). 2014. Personal communication (e-mail) between Eric Richer and Gerald Gibbens, Northern Water. Aquatic Research Scientist, Fort Collins, CO. December 4.

Colorado Water Conservation Board (CWCB). 2014. Rebuilding Flood-Damaged Diversion Structures to Benefit Multiple Uses. Accessed August 7. Available at: http://cwcb.state.co.us/Documents/ShortTermHomePage/CPWCWCBRebuildFactSheet.pdf

Corps – See U.S. Army Corps of Engineers

CPW – See Colorado Parks and Wildlife

CWCB – See Colorado Water Conservation Board

EBASCO, Harza, et al. 1990. Cache la Poudre Basin Study Extension. Prepared for Colorado Water Resources and Power Development Authority.

EPA – See U.S. Environmental Protection Agency

ERO Resources, Inc. 2008a. Wildlife Resources Technical Report, Northern Integrated Supply Project Environmental Impact Statement. March.

ERO Resources, Inc. 2008b. Wetlands and Other Waters Technical Report, Northern Integrated Supply Project Environmental Impact Statement. March.

ERO Resources, Inc. 2014. Wetlands and Riparian Resources Effects Technical Report for the Mainstem of the Cache la Poudre River, Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. Prepared for U.S. Army Corps of Engineers. June.

ERO Resources, Inc. 2015a. Wildlife Resources Technical Report Supplement, Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. March.

ERO Resources, Inc. 2015b. Vegetation and Wetland Resources Technical Report Supplement, Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. March.

Falvey, Henry T. and D. Alan Ervine. 1988. Aeration in Jets and High Velocity Flows. Proceedings of the American Society of Civil Engineers International Symposium on Model-Prototype Correlation of Hydraulic Structures, ed. Philip H. Burgi. August 9-11. Available at: http://www.usbr.gov/pmts/hydraulics_lab/pubs/PAP/PAP-0527.pdf

Ficke, Ashley D., Christopher A. Myrick, and Matthew C. Kondratieff. 2012. Evaluation of Two Rock Ramp Fishways in a Colorado Transition Zone Stream. Presented at: National Conference on Engineering and Ecohydrology for Fish Passage, University of Massachusetts, Amherst. June 5-7. Available at: http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1059&context=fishpassage_conference&sei-redir=1&referer=http%3A%2F%2Fwww.bing.com%2Fsearch%3Fq%3Dfishway%2Bdesign%2Bficke%26form%3DDLRDF8%26pc%3DMDDR%26src%3DIE-SearchBox%26adlt%3Dstrict#search=%22fishway%20design%20ficke%22

Fields, Keith A. 2015. Personal communication, e-mail to Robert Graves, Reed Goodwin, and Jim L. Struble, subject Former Atlas Site 13: Site Walk on March 11, 2015 at 2PM. Tidewater, Inc. February 20.

Fort Collins, City of. 2014a. Poudre River Downtown Master Plan – Draft. September 25. Available at: http://www.fcgov.com/poudre-downtown/

Fort Collins, City of. 2014b. Natural Areas Master Plan – Draft for Public Review. Natural Areas Department. July 31. Available at: http://www.fcgov.com/naturalareas/masterplan/index.php

Fort Collins, City of. 2014c. Ecological Response Model – An Introduction. Accessed August 12. Available at: http://www.fcgov.com/naturalareas/pdf/erm-handout.pdf

Fort Collins, City of. 2014d. McMurry Natural Area Restoration Project handout, and associated website material. Accessed August 12. Available at: http://www.fcgov.com/riverprojects/

Fort Collins, City of. 2014e. An Ecological Response Model for the Cache la Poudre River through Fort Collins. Ecological Response Modeling Team. December.

GEI Consultants, Inc. 2006. Northern Integrated Supply Project Technical Memorandum No. 2: Preliminary Assessment of Galeton Dam and Reservoir and Associated Facilities. Prepared for Northern Colorado Water Conservancy District. May 6.

GEI Consultants, Inc. 2013. Northern Integrated Supply Project and Halligan and Seaman Water Supply Projects Environmental Impact Statements, Common Technical Platform Aquatic Biological Resources Baseline Report for the Mainstem Cache la Poudre River and South Platte River. February.

GEI Consultants, Inc. 2015a. Draft Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement, Aquatic Biological Resources Effects Technical Report. March.

GEI Consultants, Inc. 2015b. Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement, Water Quality Assessment Report, Phase I. January.

Harza Engineering Company and Consultants. 1987. Cache la Poudre Basin Water and Hydropower Resources Management Study. Prepared for the Colorado Water Resources and Power Development Authority.

Hoffman, Dr. Glenn J. 2012. Impact of Water Quality Measures from the South Platte Water Conservation Project on Crop Production. Report made to the Northern Colorado Water Conservancy District. February 6.

Johnson, Brett M., Jesse M. Lepak, and Brian A. Wolff. 2015. Effects of Prey Assemblage on Mercury Bioaccumulation in a Piscivorous Sport Fish. Science of the Total Environment 506-507 (215) 330-337.

MWH. 2004. Northern Integrated Supply Project, Phase II Alternative Evaluation, Final Report. Prepared for the Northern Colorado Water Conservancy District. January.

Page, Robert W., LaJuna S. Wilcher. 1990. The Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines. Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency. Assistant Secretary of the Army, Civil Works and Assistant Administrator for Water, U.S. Environmental Protection Agency, respectively. February 6. Available at: http://water.epa.gov/lawsregs/guidance/wetlands/mitigate.cfm

Poudre River Trail Corridor, Inc. 2014. Organizational website. Accessed August 26. Available at: http://www.poudretrail.org/

Reclamation – See U.S. Department of the Interior, Bureau of Reclamation

San Joaquin River Restoration Program (San Joaquin). 2008. Temperature Model Sensitivity Analyses Sets 4 and 5. Draft Technical Memorandum. Available at: http://restoresjr.net/program_library/02-Program_Docs/index.html

Service – See U.S. Fish and Wildlife Service

The Poudre Runs Through It. 2014. Progress Report, 2012-13 Accomplishments & 2013-14 Prospectus. Accessed July 18. Available at: http://cwi.colostate.edu/ThePoudreRunsThroughIt/files/PoudreRunsThruItProgressReport.pdf

U.S. Army Corps of Engineers (Corps). 2007. Northern Integrated Supply Project Environmental Impact Statement Biological Assessment. Prepared by ERO Resources Corporation. August.

U.S. Army Corps of Engineers (Corps). 2014. Final Decision Document for F.E. Warren Air Force Base, Former Atlas "E" Missile Site 13, LaPorte, Colorado. U.S. Army Corps of Engineers, Omaha District. September 24.

U.S. Army Corps of Engineers. 2015. Northern Integrated Supply Project Supplemental Draft Environmental Impact Statement. Applicant: Northern Colorado Water Conservancy District. Omaha District.

U.S. Department of Energy. 2006. Improving Pumping System Performance. Second Edition. Office of Energy Efficiency and Renewable Energy Industrial Technologies Program. Available at: http://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/pump.pdf

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2006. Fish Protection at Water Diversions – A Guide for Planning and Designing Fish Exclusion Facilities. Water Resources Technical Publication, Denver. April. Available at: http://www.usbr.gov/pmts/hydraulics_lab/pubs/manuals/fishprotection/Fish%20Protection%20at%20Water%20Diversions.pdf

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2007. Rock Ramp Design Guidelines. Technical Service Center, Denver. September. Available at: http://www.usbr.gov/pmts/sediment/kb/SpanStructs/reports/Rock%20Ramp%20Design%20Guidelines_09-2007.pdf

U.S. Environmental Protection Agency (EPA). 1999. Manual, Constructed Wetlands, Treatment of Municipal Wastewaters. EPA/625/R-99/010. National Risk Management Research Laboratory, Office of Research and Development. Cincinnati, Ohio. September. Available at: http://water.epa.gov/type/wetlands/restore/upload/constructed-wetlands-design-manual.pdf

U.S. Environmental Protection Agency (EPA). 2004. Constructed Treatment Wetlands. Office of Water. EPA 843-F-03-013. Available at: http://water.epa.gov/type/wetlands/restore/upload/2004_09_20_wetlands_pdf_ConstructedW.pdf

U.S. Environmental Protection Agency (EPA). 2014. Wetlands Compensatory Mitigation Factsheet. Downloaded July 9. Available at: http://water.epa.gov/lawsregs/guidance/wetlands/upload/2003_05_30_wetlands_Cmitigation.pdf

U.S. Fish and Wildlife Service (Service). 2006. E-mail from Sandy Vanna-Miller, Colorado Field Office Wildlife Biologist, concurring that black-footed ferret surveys are not necessary at the 118-acre colony immediately northwest of the proposed Galeton Reservoir site. October 17.

U.S. Fish and Wildlife Service (Service). 2007. Letter to Chandler Peter, U.S. Army Corps of Engineers from Susan C. Linner, Colorado Field Supervisor, subject Northern Integrated Supply Project (NISP) – Glade/Galeton Alternative (Project) (Corps File No. 200380509). October 5.

U.S. Fish and Wildlife Service (Service). 2014. ESA Basics 40 Years of Conserving Endangered Species. Downloaded July 10. Available at: http://www.fws.gov/endangered/esa-library/pdf/ESA_basics.pdf

Urban Drainage and Flood Control District. 2010. Urban Storm Drainage Criteria Manual Volume 3, Chapter 4 - Treatment BMPs. Denver, CO. November. Available at: http://www.udfcd.org/downloads/down_critmanual_volIII.htm

Wahl, Tony L., and Doug Young. C1994. Dissolved Oxygen Enhancement on the Provo River. Hydraulic Engineer, U.S. Bureau of Reclamation, Water Resources Research Laboratory and Fisheries Biologist, U.S. Fish and Wildlife Service. Available at: http://www.usbr.gov/pmts/hydraulics_lab/pubs/PAP/PAP-0658.pdf

Windsor, Town of. 2007. Parks, Recreation, Trails and Open Lands Master Plan. Available at: http://co-windsor2.civicplus.com/DocumentCenter/Home/View/866

Windsor, Town of. 2014. Personal communication between Wade Willis, and Amy Johnson and Jerry Gibbens, Northern Water. Town of Windsor, Manager of Parks & Open Space. September 11.

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APPENDIX A - NISP CONCEPTUAL MITIGATION PLAN SUMMARY TABLE

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Table A-1. NISP Conceptual Mitigation Plan Summary Table

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
Aquatic Life and Stream Morphology																						
AG-01	Fund stream channel and habitat improvement plan ($1.0 million)	Accelerated degradation of channel geomorphology, increased flooding risk downstream of I-25, reduced Poudre River flows, reduced aquatic habitat, reduced water availability for riparian vegetation, reduced habitat for riverine special status species, increased water temperature and DO concentrations	X	X	X	X	X			X	X	X	X	X	X		X			X	X	X
AG-02	Construct stream channel improvements (2.4 miles)		X	X	X	X	X			X	X		X	X	X		X			X	X	X
AG-03	Implement and fund Poudre River Adaptive Management Program ($5 million + $50,000/yr for 20 years)		X	X	X	X	X			X	X	X	X	X	X		X			X	X	X
AG-04	Reconstruct Poudre Valley Canal with improvements in sediment diversion, fish passage, and boating safety	Reduced sediment transport capabilities, reduced aquatic habitat, reduced river-based boating days	X	X	X	X	X		X	X	X	X			X					X		
AG-05	Construct multi-objective diversion structure retrofits (4 sites)	Reduced Poudre River flows, reduced aquatic habitat.	X	X	X	X	X			X	X			X						X	X	X
AG-06	Establish recreational fishery at Glade and forebay and manage to minimize likelihood of fish consumption advisory	Reduced Poudre River recreational fishery in Fort Collins, potential fish consumption advisories due to mercury in fish tissues	X	X	X	X	X			X	X	X								X		
AG-07	Construct SPWCP diversion to avoid fish entrainment and allow fish passage	Entrainment of fish in SPWCP diversion structure and decreased fish migration past diversion	X	X	X	X		X	X		X									X	X	X

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
AG-08	Make Galeton Reservoir available to CPW for raising native warmwater fish for reintroduction	Reduced habitat availability and quality for native warmwater fish	X	X		X	X			X	X									X	X	X
AG-09	Provide fish screens for both the inlet and outlet at Galeton Reservoir	Entrainment of non-native fish in Galeton Reservoir diversions	X	X		X		X	X		X									X	X	X
Air Quality																						
AQ-01	Develop and follow emission control plan	Increased fugitive dust and particulates during construction		X		X			X										X	X	X	X
Cultural and Paleontological Resources																						
CR-01	Develop / implement Programmatic Agreement for cultural resources	Potential impacts to cultural and historic resources during construction activities		X		X		X	X	X									X	X	X	X
CR-02	Perform class III surveys of all facilities prior to construction			X		X		X											X	X	X	X
CR-03	Develop and implement treatment plans			X		X			X	X									X	X	X	X
CR-04	Coordinate mitigation of paleontological resources with CDOT	Potential impacts to paleontological resources during construction activities		X		X		X	X										X	X		
CR-05	Monitor U.S. 287 construction activities for paleontological resources			X		X		X	X										X	X		
Energy Use/Greenhouse Gases																						
EG-01	Maximize system efficiency and assess feasibility of small hydropower opportunities within NISP facilities	Use of electrical energy and carbon dioxide emissions		X		X				X									X	X	X	X

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
Streamflow Commitments																						
FW-01	Avoid NISP-related diversions through Munroe Canal	Reduced Poudre River flows, reduced aquatic habitat, reduced river-based boating days, increased water quality concentrations	X	X	X	X		X			X	X	X	X			X			X	X	X
FW-02	Curtail NISP diversions for existing Poudre River non-consumptive water rights (5-50 cfs)	Reduced Poudre River flows below Poudre Valley Canal diversion, reduced aquatic habitat, reduced water availability for riparian vegetation, reduced habitat for riverine special status species, increased water quality concentrations and DO, reduced river recreational value, nonuse value impacts	X	X	X	X		X	X		X	X	X	X			X			X	X	X
FW-03	Curtail diversions when flow is less than 50 cfs during the summer, and 25 cfs during the winter		X	X	X	X		X			X		X				X			X	X	X
FW-04	Release water from Glade Reservoir during winter and September to maintain 10 cfs in Poudre		X	X	X	X	X	X	X		X		X	X			X			X		
FW-05	Assist with securing Flow Augmentation Protection for the Poudre River		X	X		X	X			X	X	X	X	X						X	X	X
FW-06	Assess feasibility of Glade Reservoir enlargement to avoid late summer diversions	Increased stream temperature during low flow, increased water quality concentrations, reduced aquatic habitat, reduced river recreational value, nonuse value impacts	X	X	X	X				X	X	X		X			X			X		
FW-07	Ramp Hansen Supply Canal releases	Reduced aquatic habitat	X		X	X	X	X	X		X			X			X			X	X	X

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
General Construction																						
GC-01	Implement general construction BMPs	General design and construction impacts		X		X		X	X										X	X	X	X
GC-02	Develop and implement stormwater management plan			X	X	X		X	X										X	X	X	X
GC-03	Coordinate with and follow CDOT criteria and manuals for U.S. 287 realignment	General design and construction impacts due to U.S. 287 realignment and construction activities.		X		X		X	X										X	X		
GC-04	Implement BMPs to minimize impacts of rock cuts, soil cuts, fills and retaining walls			X		X			X										X	X		
GC-05	Implement intelligent transportation technologies (signage, sensors, video, weather monitoring)	Potential icing and blowing snow conditions on the roadway at the hogback cut		X		X				X									X	X		
Hazardous Sites																						
HZ-01	Implement remedial action developed by Corps, impermeable lining at forebay, monitor excavated material	Potential effects on and from trichloroethylene Plume at Glade forebay		X		X		X	X								X		X	X		
HZ-02	Develop and implement plans, monitoring and protocols to address potential Oil and Gas well issues	Potential for contamination of water stored in Galeton Reservoir, possible mobilization of existing or future contaminant plumes		X		X		X	X								X		X	X	X	X
Land Use																						
LU-01	Relocate and/or compensate private residencies, provide adequate notice for lessees	Inundation and proximity of residences at Glade Reservoir		X		X				X									X	X	X	X

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
Noxious Weeds																						
NW-01	Develop and implement noxious weed control plan during construction	Potential spread of noxious weeds during construction activities.	X	X	X	X		X	X										X	X	X	X
Recreation																						
RC-01	Lease recreation rights at Glade Reservoir, develop management plan that includes motorized boating, fishing and camping	General reduced recreational boating and fishing opportunities, reduced drive-by traffic at Ted's Place	X	X		X				X		X							X	X		
RC-02	Provide new access to State Trust Lands near Glade Reservoir	Inundation of existing access to State Trust Lands west of Glade Reservoir	X	X		X				X		X							X	X		
RC-03	Allow limited big-game hunting access adjacent to Glade Reservoir	Reduced hunter access and game harvest near Glade Reservoir	X	X		X				X		X				X			X	X		
RC-04	Replace facilities at Mitani-Tokuyasu State Wildlife Area	Loss of land and impact on facilities at Mitani-Tokuyasu State Wildlife Area due to construction of SPWCP infrastructure	X	X		X				X		X							X	X	X	X
RC-05	Allow public access for fishing and hunting at the SPWCP forebay		X	X		X				X		X							X	X	X	X
RC-06	Construct parking lot at Glade Reservoir complex for use by Poudre River recreators	Reduced river-based boating days, reduced drive-by traffic at Ted's Place	X	X		X	X			X		X							X	X		
RC-07	Construct Visitor's Center at Glade Reservoir	Loss of Prime Farmland, geologic construction disturbance, general environmental commitments	X	X		X	X			X	X	X	X	X	X	X	X	X	X	X		

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Riparian Vegetation																						
RV-01	Develop cottonwood regeneration areas in 3 specific reaches (58 acres) and adjacent to channel and habitat improvement reaches (2.4 miles)	Accelerated decline of plains cottonwood, increased water temperatures	X	X	X	X				X			X	X			X			X	X	X
RV-02	Reconnect channel to floodplain in channel and habitat improvement reaches, re-establish connection with backwater sloughs in Windsor area	Adverse effects on plant communities sensitive to alluvial groundwater levels	X	X	X	X				X	X		X	X	X		X			X	X	X
Socioeconomics																						
SE-01	Monitor water quality of ditch deliveries and crop yields, maintain appropriate blending ratios to prevent yield reductions	Potential loss of yield for sensitive crops during certain SPWCP operating conditions.		X		X				X							X		X	X	X	X
SE-02	Investigate opportunities to compensate potential crop yield loss with ditch company delivery augmentation			X		X	X			X									X	X	X	X

Item No.	Description	Mitigated Effects	Mitigation Process					Mitigation Type			Mitigated Resources									Applicable Alternative		
			CPW[1]	NEPA[2]	404(b)(1)[3]	Public Interest[4]	Enhancement[5]	Avoidance[6]	Minimization[7]	Compensation[8]	Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other	Alternative 2	Alternative 3[9]	Alternative 4[9]
Special Status Species																						
SS-01	Construct compensatory mitigation for Preble's meadow jumping mouse surrounding Glade Reservoir Forebay	Impacts to Preble's meadow jumping mouse habitat	X	X	X	X				X	X			X		X		X		X	X	X
SS-02	Conduct surveys for bald eagles; for active nests, avoid activities within ½ mile November 15-July 31, limit activities within ¼ mile, do not cut nearby large trees	Potential effects to bald eagle	X	X		X		X	X					X						X	X	X
SS-03	Conduct surveys of Colorado butterfly plant for 2 years prior to construction	Potential effects to Colorado butterfly plant		X	X	X		X		X				X						X	X	X
SS-04	Conduct surveys for Ute ladies'-tresses orchid for 2 years prior to construction	Potential effects to Ute ladies'-tresses orchid		X	X	X		X		X				X						X	X	X
SS-05	Offset depletions through membership in SPWRAP	Effects to Platte River target species		X	X	X		X	X	X				X						X	X	X
SS-06	Reevaluate and resurvey prairie dog colonies potentially impacted during construction	Potential impacts to black-footed ferret	X	X		X		X	X	X				X						X	X	X
SS-07	Relocate black-tailed prairie dogs prior to construction, follow CDOT guidelines	Potential impacts to black-tailed prairie dog	X	X		X		X	X					X						X	X	X
SS-08	Survey for swift fox den sites, coordinate conservation measures with CPW	Potential impacts to swift fox	X	X		X		X	X	X				X						X	X	X

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SS-09	Resurvey prairie dog colonies for proposed disturbances, coordinate with CPW for any burrowing owls found	Potential impacts to burrowing owl	X	X		X		X	X	X				X						X	X	X
SS-10	Implement proposed mitigation for wetlands and riparian habitat to benefit these species.	Potential impacts to common gartersnake, northern leopard frog, smokey-eyed brown butterfly, two-spotted skipper, American currant	X	X		X		X	X	X			X	X				X		X	X	X
SS-11	Conduct surveys in potential habitat prior to construction, reestablish populations where impacts are unavoidable	Potential impacts to Bell's twinpod	X	X		X		X	X	X				X						X	X	X
Terrestrial Wildlife																						
TW-01	Construct underpass to accommodate wildlife movement	Impacts to big game migration in the area inundated by Glade Reservoir and affected by U.S. 287 realignment	X	X		X		X	X							X				X		
TW-02	Monitor road kills for 10 years and retrofit culvert underpass on if needed		X	X		X		X	X							X				X		
TW-03	Survey and mark active nests to establish no-work zones during breading seasons	Potential effects on migrating birds, raptors, amphibians, reptiles and other wildlife	X	X		X		X	X							X				X	X	X
TW-04	Conduct vegetation clearing during nonbreeding season, when possible		X	X		X		X	X							X				X	X	X
TW-05	Follow CPW recommended buffer zones and seasonal restrictions within certain distances of nest sites for raptors		X	X		X		X	X							X				X	X	X

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TW-06	Conserve land surrounding Glade Reservoir as big game habitat	Loss of big-game habitat at Glade Reservoir and Galeton Reservoir	X	X		X	X			X		X				X				X		
TW-07	Provide funding for regional big game habitat and migration corridor preservation ($1.0 million)		X	X		X	X			X		X				X				X		
Visual																						
VS-01	Revegetate and plant screening with native plants, blend cuts and fills	Altered views due to the construction of Glade and Galeton Dams		X		X				X									X	X	X	X
Wetlands and Other Waters																						
WL-01	Develop approximately 56 acres of wetlands below Glade Reservoir	Direct impacts to 41.6 acres of wetlands at Glade Reservoir, loss of Preble's habitat	X	X	X	X				X			X	X				X		X	X	X
WL-02	Develop approximately 3 acres of wetlands near U.S. 287 realignment	Direct impacts to 2.5 acres of wetlands near U.S. 287 realignment	X	X	X	X				X			X	X				X		X		
Water Quality																						
WQ-01	Construct multi-level outlet tower at Glade Reservoir to convey Poudre River releases	Potential increases in temperature, DO, copper, manganese, nutrients and selenium, and other conservative constituents especially during times of reduced flows.	X	X	X	X		X	X		X						X			X		
WQ-02	Construct Glade Reservoir release structures with baffling to provide aeration		X	X	X	X		X	X		X						X			X		

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WQ-03	Construct approximately 10 acres of wetlands in Eaton Draw to reduce ambient water quality concentrations in Lower Poudre River	Potential increased WQ concentrations in Poudre River near Greeley, increased sedimentation in lower Poudre, direct impacts to 0.3 acres of wetlands at Galeton Reservoir		X	X	X	X			X							X	X		X	X	X
WQ-04	Establish/enhance streamflow and water quality monitoring network	General water quality effects, monitoring required to implement provisions of this mitigation plan	X	X	X	X				X	X	X			X		X		X	X	X	X
WQ-05	Provide funding and participate in Coalition for the Poudre River Watershed	General water quality, aquatics, vegetation, noxious weeds, recreation, riparian effects		X		X	X			X	X	X	X				X		X	X	X	X

[1] Mitigation requested by the Colorado Division of Wildlife following Draft EIS or likely to be requested or required as part of Colorado Fish and Wildlife Mitigation Plan.

[2] Mitigation for project effects presented in the EIS.

[3] Mitigation effects focused on by the 404(b)(1) Guidelines.

[4] Mitigation effects considered by the Corps in their public interest review.

[5] Mitigation that does not address effects identified in the EIS, but could improve degraded resources or help agencies meet their mission.

[6] Will avoid adverse effects.

[7] Will minimize adverse effects.

[8] Will compensate for adverse effects.

[9] Mitigation described in this plan is directly applicable to Northern Water's preferred alternative (Alternative 2). Mitigation that is either directly or indirectly applicable to other alternatives is indicated. Mitigation activities that are indirectly applicable would be similar in concept, but modified specifically for the alternative.

APPENDIX B - NISP CONCEPTUAL MITIGATION PLAN SUMMARY MAPS

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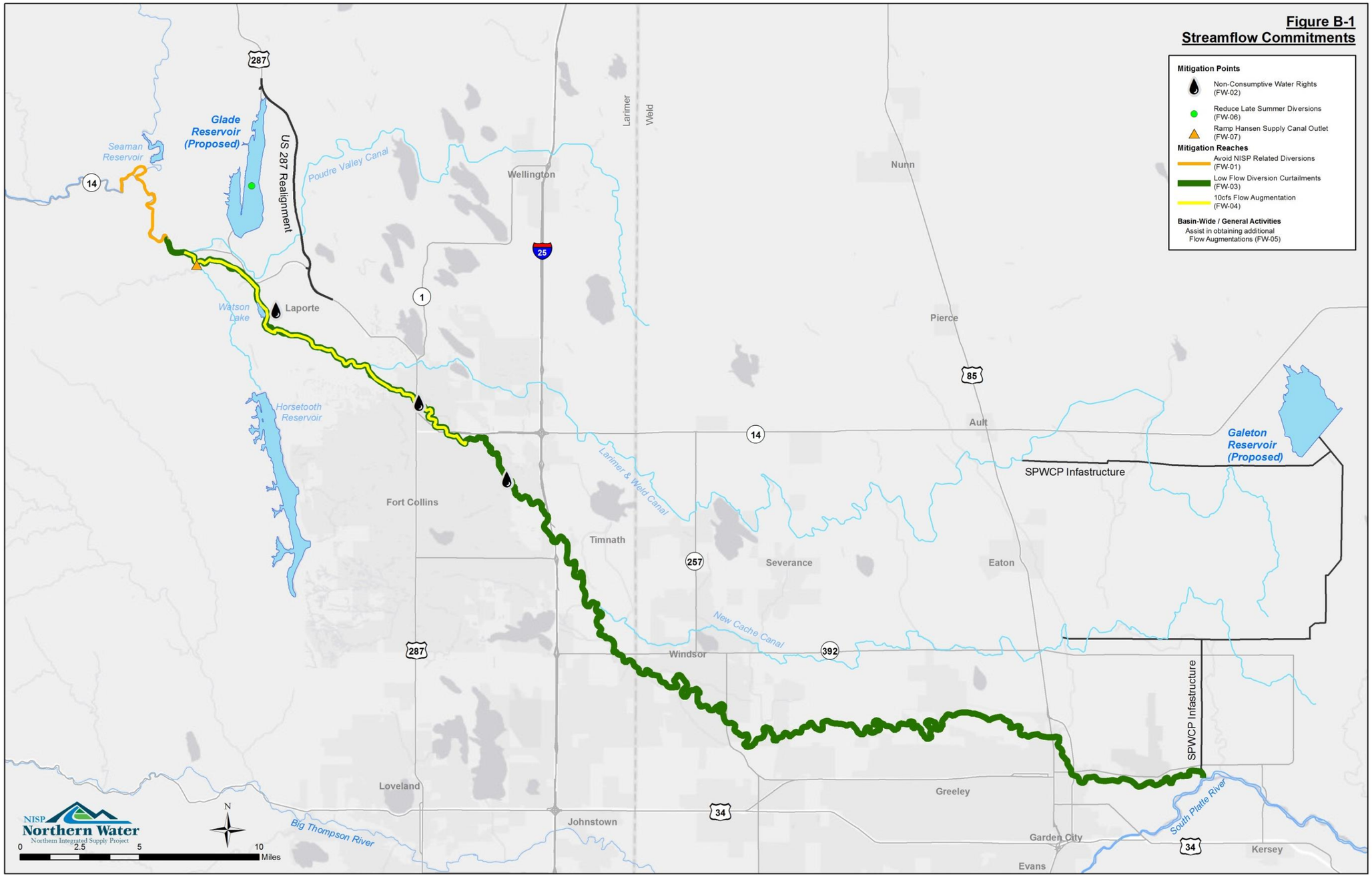

Figure B-1. Streamflow Commitments

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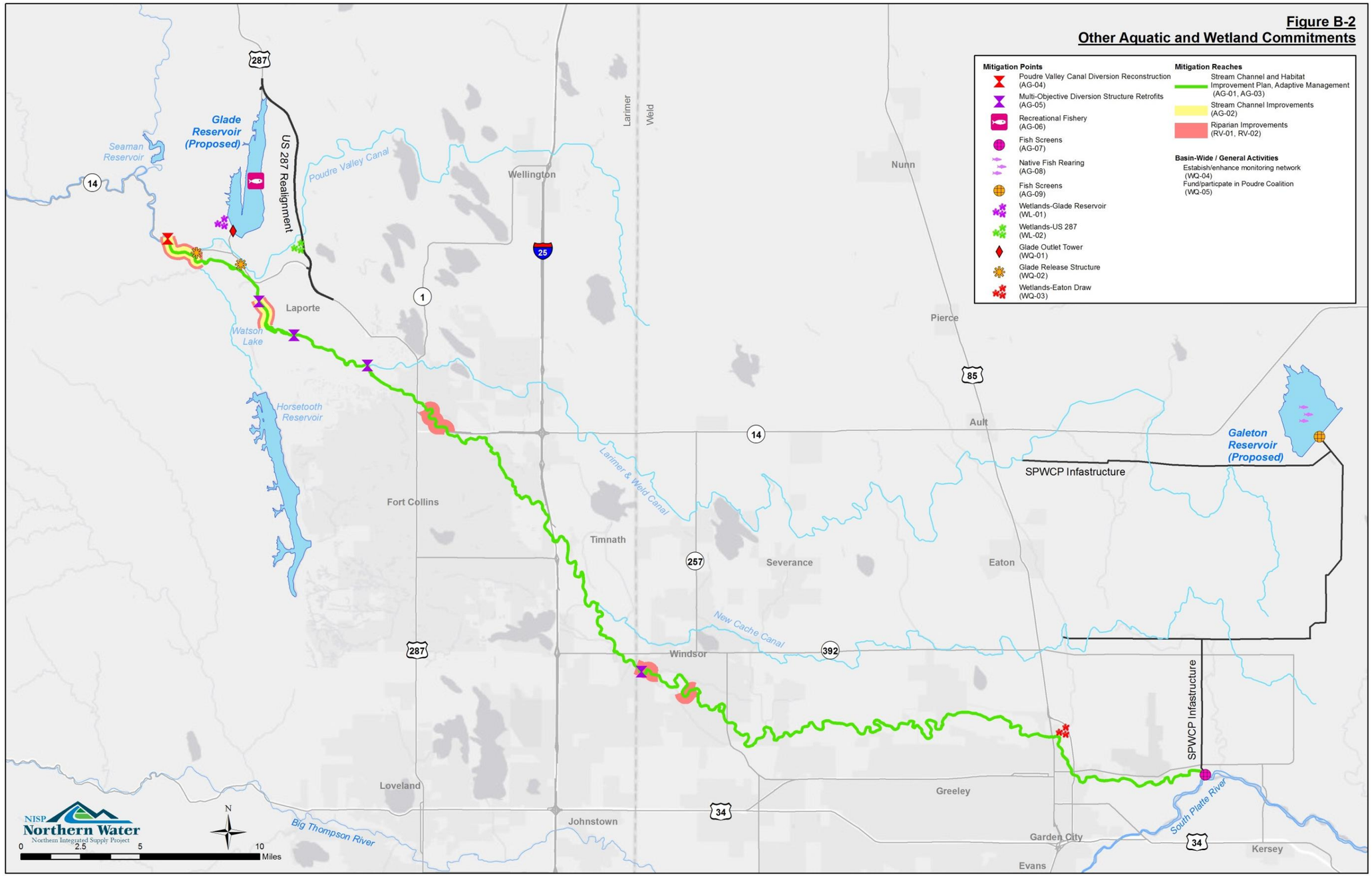

Figure B-2. Other Aquatic and Wetland Commitments

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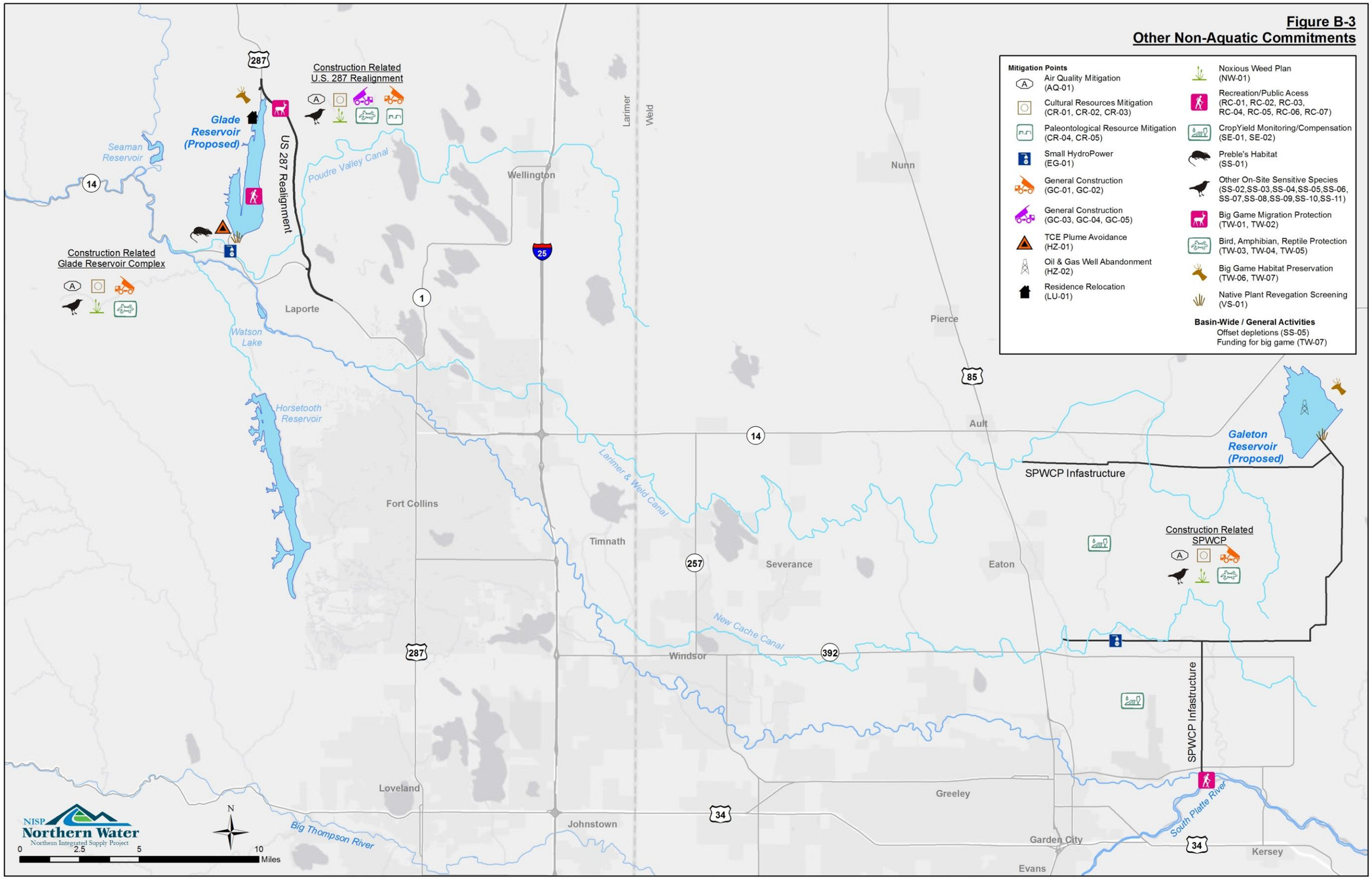

Figure B-3. Other Non-Aquatic Commitments

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